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MEASUREMENT OF ICE FORCES ON SMALL VESSELS VOLUME I - TECHNICAL REPORT

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Transportation Development Centre

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LANGUAGE NOTICE

Un sommaire en français de ce rapport est inclus avant la Table des matières.

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17 Abstract

This report discusses the second phase in a project to investigate ice loads on the hulls of small vessels. An array of strain gauges had previously been fitted to the starboard bow of the National Sea Products vessel CAPE BRIER. The instrumentation system was designed to monitor the gauges continuously, and to activate the recording system when any of the gauges exceeded a threshold strain, indicating loading activity. During a two week voyage in late winter 1987, south and east of Newfoundland, 784 minutes of ice activity were recorded.

The results from these tests can assist in assessing the adequacy of, and setting standards for the design of frames, stringers, and hull plating for lightly ice-strengthened vessels.

In addition, the project has provided invaluable information on the techniques for measuring ice loads on ships.

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17 Résumé

Ce rapport traite de la phase II d'un programme d'étude de la charge exercée par les glaces sur la coque des bateaux de petite taille. À cette fin, le chalutier CAPE BRIER appartenant à la National Sea Products avait été équipé d'un réseau de jauges extensométriques, s'étendant sur la proue tribord. L'information transmise par les capteurs était recueillie par la chaîne de mesure qui l'enregistrait dès que la déformation dépassait un seuil de consigne, signifiant ainsi qu'une charge était exercée. Durant le voyage de deux semaines fait vers la fin de l'hiver 1987, au sud et à l'est des côtes de Terre-Neuve, les interactions bateau-glaces significatives ont duré au total 784 minutes.

Les résultats de la recherche visent à aider dans l'appréciation des normes actuelles ou futures sur la tenue aux glaces des bateaux dont la coque a été légèrement renforcée.

En outre, la recherche a permis d'enrichir les connaissances sur les techniques de mesurage des charges exercées par les glaces sur la coque des navires.

18 Mots-clés	19 Diffusion
Charges, forces, glaces, membrure, coque, bateau de pêche.	Le Centre de développement des transports dispose d'un nombre limité d'exemplaires.

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SUMMARY

This report discusses the second phase in a project to investigate ice loads on small vessels in light ice conditions. The fishing trawler 'CAPE BRIER' was fitted with an array of strain gauges to measure ice loads over 3.8 m^2 of the starboard bow. This phase of the project included the placement of twelve additional strain gauges, further finite element modelling and physical calibrations. Improved data collection hardware and software were designed and installed. Data was collected during operations off the Newfoundland coast and is presented and analyzed in this report.

The ice load panel in the CAPE BRIER is made up of seven pairs of shear strain gauges on each of five adjacent main frames. A web frame, which is adjacent to the instrumented main frames and forms the forward edge of the panel, is instrumented with seven pairs of shear strain gauges. A large stringer, which is approximately midway between decks and divides the panel horizontally, is fitted with five pairs of shear strain gauges. The gauges allow the determination of the shear distribution along each member. From this, the applied ice loads can be derived.

The data acquisition software scanned all channels continuously, in eight-minute scan periods. When ice loads caused activity above a pre-set threshold, the data was stored. The stored data consisted of three files for each eight-minute interval of activity:

- A 47 X 47 array of strains, each row of which contained simultaneous readings from all gauges, at a time corresponding to the peak of a particular gauge.
- A vector array containing the time at which each gauge peaked (i.e., time of each row).
- A vector array containing the average of all values for a given gauge over the entire interval.

One of the recommendations of the first phase of the work in 1984 was that a more detailed finite element model be constructed in order to obtain a more accurate estimate of loads from measured strain. This refined model was constructed; however the correlation between the physical calibration and the finite element model was not significantly improved over that in the first phase. Strain prediction errors of 50% and more were still found to exist. As a result, the ice loads derived from the new finite element model, lack credibility.

To obtain ice pressure data, an algorithm was developed directly from the physical calibration. This algorithm proved suitable for those frames that were calibrated (Frames 59 1/2, 60 1/2 and 61 1/2), but less suitable for those frames that were not calibrated (Frames 60, 61 and 62). More extensive physical calibration would permit pressure data to be extracted from the uncalibrated frames because the problem was primarily with the assumptions made in the conversion algorithm.

In total, 105 eight minute data sets were collected, 98 of which were above the ice load threshold, representing 13 hours of ice activity.

A log of the ship's navigation and ice information was kept during the voyage.

Statistical analysis of individual panel pressures was performed and is presented as histograms and cumulative probability plots. Higher ice load pressures were recorded above the horizontal stringer than below. It was also observed that the peak pressure was directly related to the number of measurements involved. This signifies that although the highest individual pressure measured was 2.67 MPa in 784 minutes of ice activity, a higher pressure would be likely if the measurement time was increased. The extreme value analysis indicates that a peak of 3.4 MPa may be expected for about 5-1/2 days of ice activity, (5-1/2 days equals 1000 eight-minute intervals).

Statistical analysis of frame and grillage loads (i.e., line and area loads) was performed and shoved that the peak pressure decreased sharply as the length or area of the load increased, and that the peak frame loads were approaching an upper limit.

Measured pressures were of the same magnitude as the design pressures for the plating, and the evidence suggests that plastic deformation is most probable in these ice conditions. This deformation would, however, be small and barely discernible.

While the results were less than expected owing to the inability to achieve a satisfactory ice pressure calibration function for the whole panel and to the small amount of ice activity, the project has provided the first evidence of fishing vessel structure response in ice. It also revealed shortcomings in the measurement technique that warrant further study.

Recommendations are made both for the general problem of measuring ice loads on ships and for the future of the CAPE BRIER program.

SOMMAIRE

Ce rapport traite de la phase II d'un programme d'étude de la charge exercée par des glaces de faible épaisseur sur la coque de petits bateaux. À cette fin, le chalutier CAPE BRIER avait été équipé d'un réseau de jauges extensométriques s'étendant sur une zone de 3,8 m^2 de la proue tribord. Les travaux compris dans cette phase ont été les suivants: mise en place de 12 jauges supplémentaires, affinement de la modélisation par la méthode des éléments finis, étalonnage des éléments de mesure ainsi que conception et installation d'une chaîne de mesure améliorée. La saisie des données a été faite au large de Terre-Neuve; leur analyse est présentée dans le rapport.

Le panneau instrumenté comporte sept paires de jauges sur chacune de cinq membrures contiguës instrumentées, jauges servant à mesurer les déformations dues au cisaillement. Une porque contiguë, correspondant à l'extrémité avant du panneau instrumenté, a été équipée à son tour de sept paires de jauges, tandis que la serre qui se trouve environ à mi-chemin entre les deux ponts et divise le panneau instrumenté en deux dans le sens horizontal a été équipée de cinq paires. Ces jauges permettent de déterminer la distribution des forces de cisaillement de long des membrures. À partir de là, les forces exercées par les glaces peuvent être calculées.

L'information transmise par les capteurs était recueillie par blocs de 8 minutes, l'enregistrement des forces se faisant dès que la déformation dépassait un seuil de consigne. Les données ainsi enregistrées étaient stockées dans trois fichiers, à savoir:

- un fichier bidimensionnel disposé en colonnes et en rangées, pour l'enregistrement simultané des signaux des 47 jauges lorsque la déformation captée par une jauge quelconque atteint une valeur maximale.
- un fichier où est stocké l'heure précise correspondant à chaque valeur maximale de charge enregistrée dans chacune des colonnes.
- un fichier où est stocké la moyenne des valeurs de charge enregistrées par chaque jauge durant la période de mesure.

Comme suite à une des recommandations faites à l'issue des travaux de la phase I en 1984, le modèle obtenu par la méthode des éléments finis a été affiné, de manière à pouvoir tirer des déformations mesurées des prévisions plus précises sur les charges exercees. Toutefois, la corrélation entre le résultat produit par l'étalonnage et celui tiré du modèle ne s'est pas améliorée par rapport à la phase I. Vu la persistance d'erreurs de 50 p.100 et plus dans les prévisions du modèle, il s'ensuit que les charges des glaces calculées à partir de ces données sont sujettes à caution.

La pression des glaces a été obtenue par conversion des résultats de l'étalonnage à l'aide d'un algorithme. Cette méthode a donné de bons résultats à l'égard des membrures qui avaient servi à l'étalonnage (membrures 59 1/2, 60 1/2 et 61 1/2), mais ils ont été moins bons vis-à-vis de celles dont les jauges n'avaient pas été étalonnées (membrures 60, 61 et 62). Un étalonnage plus poussé permettrait d'apprécier la valeur des pressions qui sollicitent les membrures non étalonnées, étant donne que les lacunes constatées sont attribuables avant tout aux hypothèses retenues pour l'élaboration de l'algorithme de conversion.

Au total, 105 blocs de 8 minutes d'information ont été obtenus, desquels 98 ont dépassé le seuil de consigne, soit 13 heures d'interactions bateau-glaces significatives.

Durant le voyage, les données concernant l'itinéraire et les conditions glacielles ont été consignées dans le carnet de bord.

L'analyse des valeurs de pression observées sur les éléments panneaux a permis d'établir des statistiques sous la forme d'histogrammes et de graphiques montrant les distributions de probabilité cumulative. Les valeurs de pression observées ont été plus élevées au-dessus de la ligne de démarcation représentée par la serre qu'au-dessous. Il a également été observé que la pression maximale est directement reliée au nombre de mesures prises en compte. En d'autres termes, si, durant les 784 minutes d'interactions bateau-glaces significatives, la pression maximale observée a été de 2,67 MPa, cela ne veut pas dire qu'une valeur supérieure à celle-ci n'aurait pas pu être observée au bout d'un temps d'observation prolongé. L'analyse des valeurs extrêmes observees permet d'estimer à 3,4 MPa la valeur extrême qui pourra être observée au bout de 5 1/2 journées d'opérations dans les glaces, soit 1000 blocs de 8 minutes.

L'analyse statistique des charges sollicitant les membrures et les éléments panneaux, c'est-à-dire les charges linéaires et surfaciques, démontre que les valeurs maximales de pression diminuent rapidement à mesure que les longueurs ou les surfaces prises en compte augmentent, et aussi que les charges maximales sur les membrures commençaient à s'approcher de la limite supérieure.

Il a été constaté que les pressions mesurées sont du même ordre que les pressions de référence prévues sur le bordé, ce qui porte à croire à la probabilité d'une déformation plastique due aux conditions glacielles observées, mais cette déformation serait de très faible amplitude, voire difficile à discerner.

Bien que les résultats de la recherche ne soient pas à la hauteur de ceux escomptés, à cause de l'inaptitude du modèle à figurer avec justesse les valeurs produites par l'étalonnage du panneau instrumenté et en raison de la faible durée des interactions bateau-glaces

significatives, il reste qu'elle a été la première à mettre en évidence la tenue d'un bateau de pêche aux glaces. Quant aux faiblesses des techniques de mesurage mises en oeuvre, seule une recherche plus poussée permettra de les corriger.

Des recommandations sont formulées concernant le mesurage de la charge des glaces sur la coque des navires en genéral et en ce qui a trait à la poursuite du programme à bord du CAPE BRIER.

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NOMENCLATURE

C_o	Constant
E	Young's Modulus
I	Cross Sectional Moment of Inertia of Member
$\|K\|$	Ice Pressure Calibration Matrix
K_i	Ice Pressure Calibration Value for row i, column i
P	Design Ice Pressure
P_i	Pressure on Panel 'i'
$\{P\}$	Hull Pressure Vector
Q	First Moment of Area about Neutral Axis
S	Frame Spacing
t	Thickness (flange and shell plate) (under gauge)
V	Shear Force
ΔV	Shear Force Difference
V_i	Shear Force for Gauge 'i'
ΔV_i	Shear Force Difference for Panel i
w	Maximum Permanent Set
ε	Strain
$\{\Delta\varepsilon\}$	Strain Difference Vector
σ_y	Yield Strength of Material
ν	Poison's Ratio in Elastic Range
ν_p	Poison's Ratio in Plastic Range
$\mu\varepsilon$	Micro strain

1. INTRODUCTION

Around the coast and in the inland waterways of Canada, small ships such as fishing trawlers, ferries, and scientific ships regularly operate in ice covered waters. These ships have relatively light scantlings, compared with icebreakers, since they are designed to operate in broken ice or open pack conditions. Ice strengthening of such vessels is based on the Baltic Ice Rules [1] or the ice rules of the Classification Societies [2,3]. Despite the large numbers of such vessels, no data on ice loads on small ships in Canadian waters has been obtained. The objective of the work reported herein was to collect data on ice loads on small vessels off the Canadian East Coast.

This report which describes the second phase of a project initiated in 1984 should be read in conjunction with reference [4]. This earlier report describes much of the background to the present work and includes a survey of ice damage to fishing vessels, along with a detailed description of the ice load measurement system prior to its enhancement for this phase of the project. Initial ice pressure statistics for documented ice conditions are also presented.

In this phase of the study, the measuring system was extended and improved; twelve additional strain gauges were added; the electronic instrumentation system was substantially improved; and, a new ice load algorithm based on the physical calibration was employed.

This project met with two significant problems. The first was the difficulty of achieving a satisfactory agreement between the physical calibration of the ice load panel and a finite element model of the structure. This problem is addressed in detail in the report. The second was the shortage of data due to the ship's schedule and the unpredictability of the ice pack.

2. PROJECT OVERVIEW

2.1 Background

Ice loads on ships are stochastic. Measured local pressures on hulls have indicated that the ice loads are random (e.g. [5]). Based on the data obtained to date it seems that, in most cases, the statistical distributions are open ended (i.e. having no apparent upper limit on pressure). To understand this phenomena and better define the pressure data, it is necessary to gather enough statistical data to properly quantify the distributions. It is also important to learn as much about the physics of the process as possible in order to reduce uncertainty. The statistical data must be complemented by deterministic data in which actual ice conditions are measured so that the loading measurements can be linked to a particular set of conditions.

There are a number of precedents to the present work, the significant ones being listed in Table 2.1. The introduction of digital microcomputers and fast/inexpensive A/D (analog to digital conversion) devices in data acquisition systems made it possible to gather large amounts of data and perform complex conversions to engineering values. For example, the system developed for the USCGC POLAR SEA [5,6,7] employed 64 channels of A/D converters, resident in a microcomputer, interfaced to a desk-top computer (Hewlett Packard 9816) which converted and stored the data from 60 strain readings 32 times per second.

In parallel with the development of digital data acquisition systems came a new approach to measuring ice load data. A portion of the structure of the vessel is transformed into a transducer using strain gauges. The strain gauge location is determined from extensive finite element analysis of the response of the structure to typical loads. With this approach, all data reduction algorithms are developed in advance. The relationship between load and strain stiffness is determined through the F.E. model, validated with a full scale calibration. This approach has been successfully employed on several ships and offshore structures.

TABLE 2.1
ICE LOAD MEASUREMENT PROJECTS ON SHIPS
(PARTIAL LIST)

VESSEL	YEAR	TRANSDUCER TYPE (1)	NO. OF TRANS.	TYPE OF DATA (1)	GEOGRAPHIC LOCATION	NO. OF IMPACTS	PERFORMING ORGANIZATION
M.V. ARCTIC[9]	1979	S.G.(Bend.)	238	Ice Pressure	East. Arctic	32 tapes	Various
SISU[14]	1979	Varsta	4	Ice Pressure	Baltic	60 day	VTT
LOUIS ST.LAURENT[15]	1979	Pre.Sensors**	25	Ice Pressure	Baffin Bay		Arctec Canada
M.V. KIGORIAK[11]	1981	S.G.(Shear)	42	Ice Pressure	Beaufort	397	Canmar
USCGC POLAR SEA[5]	1982	S.G.(Comp.)	80	Ice Pressure	U.S Beaufort Sea	167	Arctec Canada
M.V. ARCTIC[10]	1982	S.G.		Ice Pressure	East. Arctic		VTT
SISU[13]	1982	S.G.(Shear)	20	Ice Pressure	Baltic	33 min.	VTT
USCGC POLAR SEA[6]	1983	S.G.(Comp.)	80	Ice Pressure	Bering, Chuckchi	1226	Arctec Canada
USCGC POLAR SEA[6]	1984	S.G.(Comp.)	80	Ice Pressure	Antarctic	309	Arctec Canada
USCGC POLAR SEA[6]	1984	S.G.(Comp.)	80	Ice Pressure	U.S. Beaufort Sea	337	Arctec Canada
M.V. ARCTIC[8]	1984	S.G.(Bend.)	15	Bow Force	Baffin Bay	143	VTT, G&M
M.V. KIGORIAK[12]	1984	S.G.(Sh/Bend)		Bow Force	Beaufort		Canmar
M.V. CAPE BRIER[4]	1984	S.G.(Shear)	35	Ice Pressure	Labrador	86	Arctec/FRDL
USCGC POLAR SEA[7]	1985	S.G.(Bend.)	42	Bow Force/Pre	U.S. Beaufort Sea	40	Arctec Canada
M.V. CAPE BRIER*	1987	S.G.(Shear)	47	Ice Pressure	Labrador	97	Arctec/FRDL

[] numbers in square brackets refer to references.

* this study

SG = Strain Gauge; Comp = Compression in Veb; Bend = Bending at Flange

Varsta = 20 cm diameter Pressure Transudcer (not hull penetrating)

** .78 cm hull penetrating transducer

VTT - Technical Research Centre of Finland

G&M - German & Milne

2.2 Description of Ship

The ship used in this study was the MV CAPE BRIER, a 50 m stern trawler whose main particulars are given in Table 2.2. The BRIER has been strengthened for service in ice to the Lloyds Register highest non-arctic ice class (1A - Super). The CAPE BRIER is operated by National Sea Products Limited and is regularly used to fish in ice covered waters off the Labrador Coast. The bow structure of the CAPE BRIER consists of light frames comprising angle bar (200 x 100 x 12 mm), web frames (500 x 150 x 12 mm 'tee' section) and stringers (600 x 150 x 12 mm 'tee' section). The transverse frames are spaced at 300 mm (≈1 ft), which is half the nominal frame spacing. The shell plate thickness in the instrumented portion of the bow is 20 mm.

TABLE 2.2

GENERAL PARTICULARS OF THE MV CAPE BRIER

Length Overall	49.9 m
Length between Perpendiculars	42.0 m
Beam Moulded	11.8 m
Draught	4.13 m (worst Op)
Displacement	1123 tonnes
Block Coefficient	.55
Power	2000 BHP
Speed (trial)	13.5 kts
Classification	LR 100A1 + LMC (hull = 1A Super)

2.3 Selection of Ice Panel Location

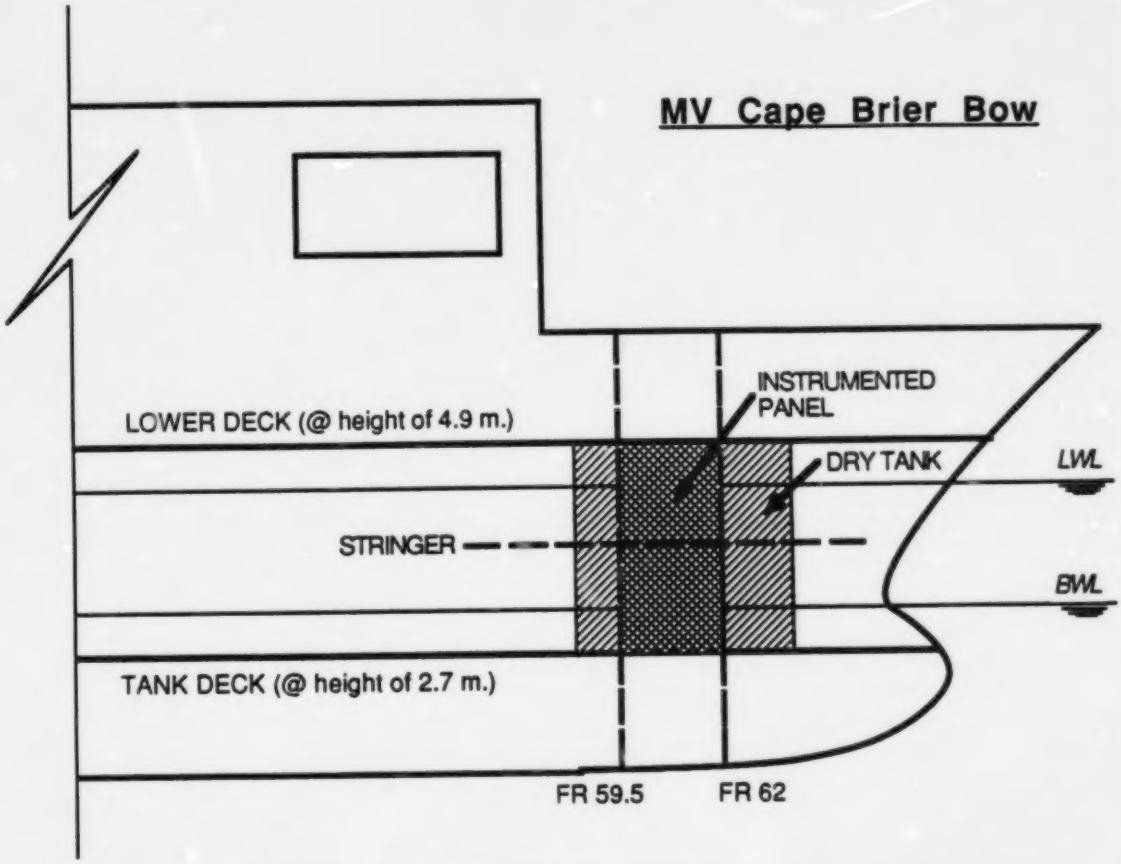
The location of the instrumented panel (seen from outside in Figure 2.1 and from inside in Figure 2.2) was chosen to meet the following conditions:

- significant ice activity
- accessible
- dry environment

The ship's 'dry tank', on the starboard bow shoulder, was chosen to meet these conditions. The tank is between the 'tank deck' and the 'lower deck' between frames 59 and 65. Access was available through one man-hole from a stairwell.

FIGURE 2.1

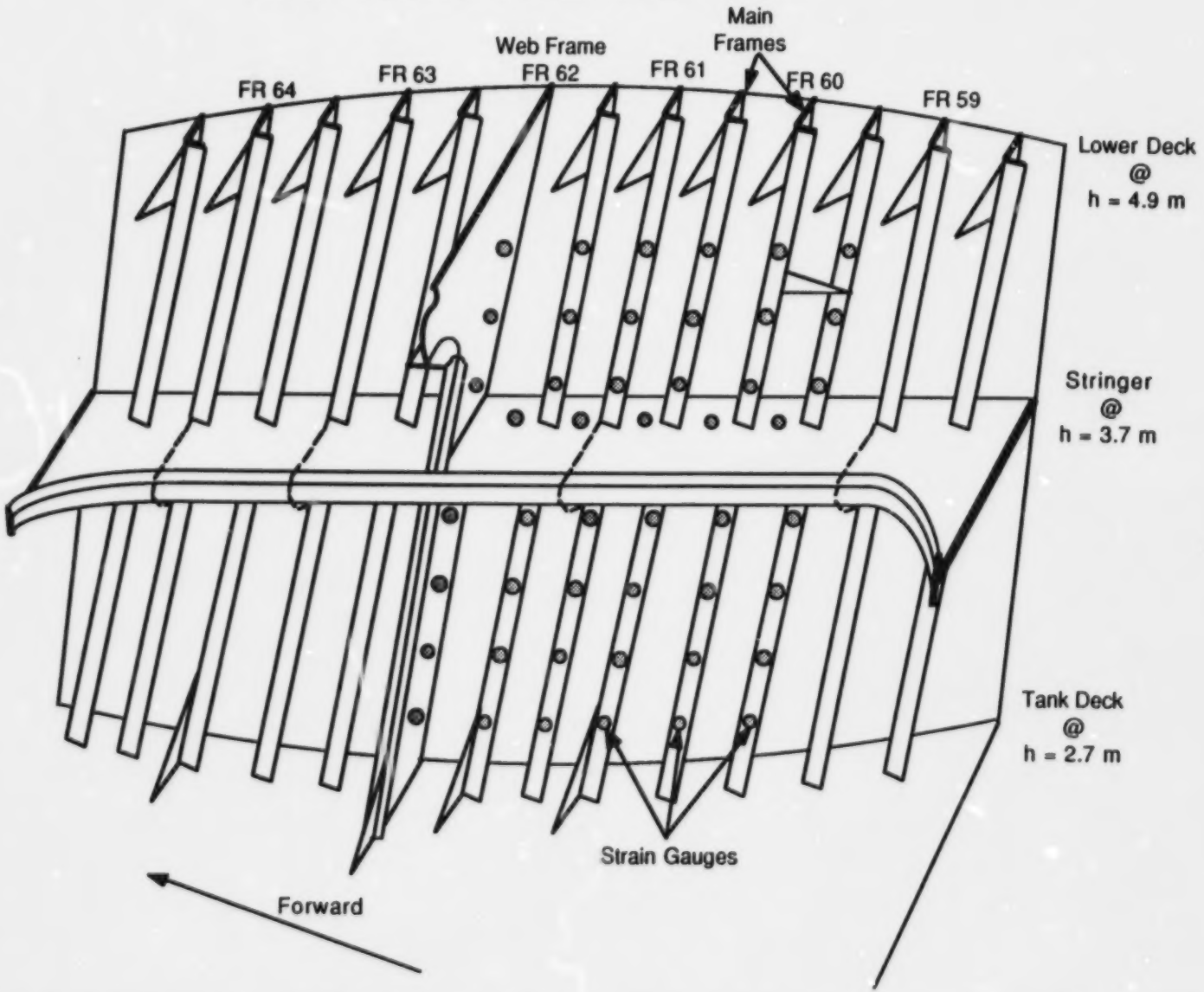
LOCATION OF INSTRUMENTED PANEL



DESCRIPTION:

- **Area of high ice related activity located ahead of shoulder on starboard bow, near waterline.**
- **Corresponds to a 'dry tank' area on inside.**
- **Instrumented panel consists of five mainframes with a large web frame forming the forward boundary, and a deck at top and bottom. Frames are intersected by stringer.**

Figure 2.2
Instrumented Panel from Inside



3. INSTRUMENTATION SYSTEM DEVELOPMENT

3.1 Overview

The instrumentation system designed and installed for this project was a further development of that used in Phase I and reported in [4]. It incorporated the following features:

- Analog signal conditioning of up to 64 channels of strain gauges.
- Digital sampling of up to 64 channels at about 50 Hz (or 47 channels at about 70 Hz).
- Storage of all panel readings each time any gauge peaked (above a pre-set threshold).
- Data storage on small convenient data cassettes.

3.2 Electronic Hardware

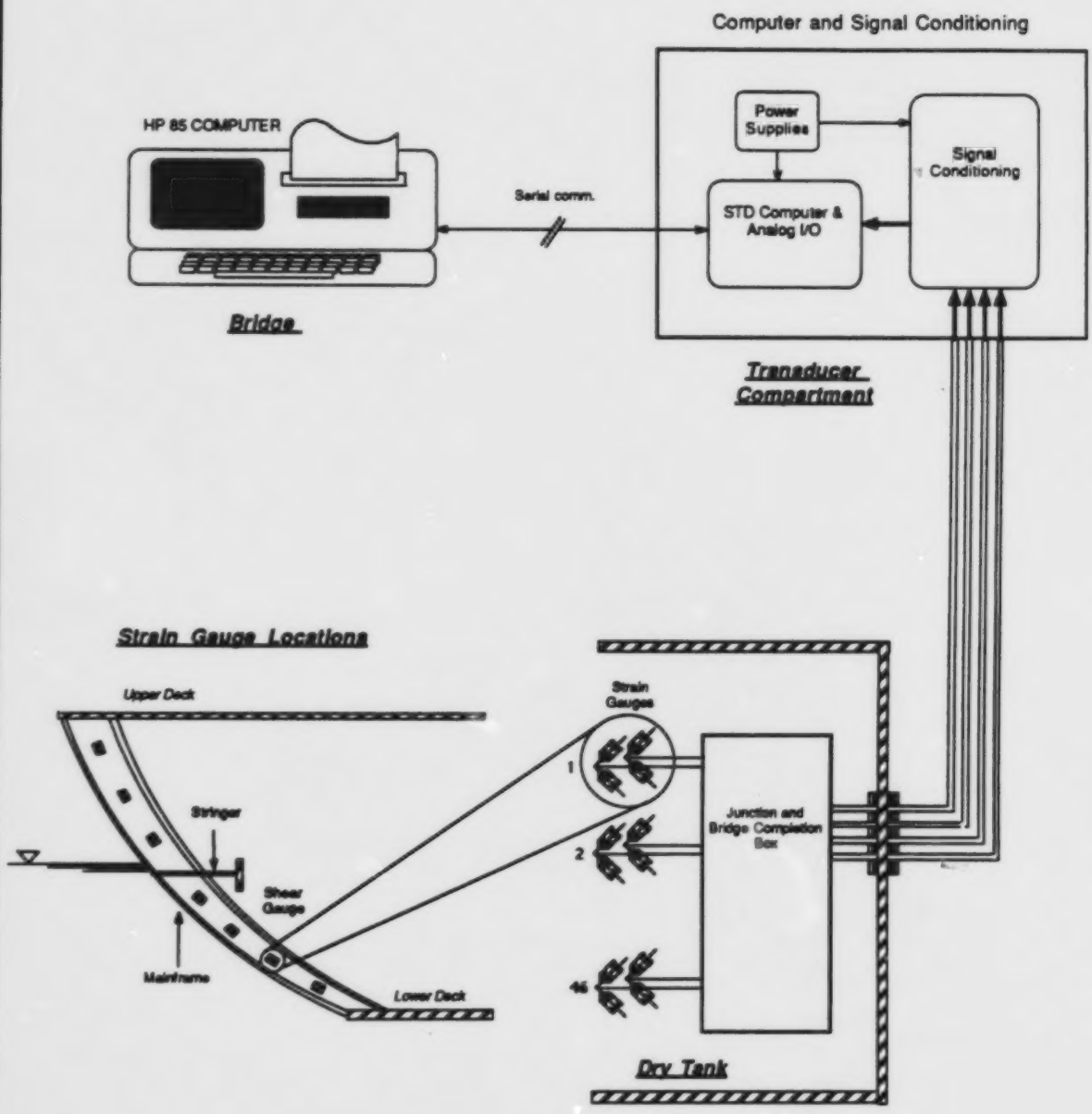
Figure 3.1 shows an overview of the instrumentation hardware. The strain gauges in the 'dry tank' are wired through a junction and bridge completion box, into custom signal conditioning circuitry located in a housing just outside the 'dry tank'. The signal conditioners provide an excitation voltage to the gauges, and amplify and filter the gauge signal.

The data acquisition computer is also located outside the 'dry tank'. The analog circuitry was custom designed and built to perform as desired in a marine environment as no comparable hardware existed at the time. The digital circuitry was developed based on STD standard single board Z80 microprocessor-based computers, specially housed for this application. A 12 bit digital word is produced by the analog/digital converter (providing a resolution of 1:4096.) The gains were set to provide a total range of $\pm$ 200 micro strain in shear. The data acquisition computer controls all measurement tasks and transmits data via a serial interface to a Hewlett-Packard HP85 desk-top computer located in the wheelhouse.

The HP85 is a rugged fully integrated microcomputer (keyboard, screen, printer and tape drive, as well as processor and memory) which is used to display and selectively store the data. The wheelhouse computer has a number of functions in addition to data storage, all of which allow the user to see the activity and condition of the panel and change settings (e.g. gain, zeros, threshold values) if required. When a tape is full the software displays a request on the screen for the operator to change tapes and restart the process.

Figure 3.1

MV Cape Brier Ice Load Instrumentation



3.3 Data Acquisition Software

The data acquisition software, resident on the Z80 data acquisition computer, maintains and updates three data arrays using data recorded during sequential eight minute measurement periods. These are:

- The peak array: This is a two dimensional array in which both the columns and rows represent gauge readings on each of the gauges (i.e. 47 gauges, 47 columns, 47 rows). The data from all gauges is recorded in a row each time a gauge exhibits a higher strain than before. Thus the n^{th} row stores the data from all gauges, when the n^{th} gauge registers a higher strain than before. At the end of the eight minute period, this array displays the readings on all gauges at the time when each gauge peaked.

- Average vector: This single column array contains a running sum of all measured values for each gauge over the measurement period and is used to calculate the average strain (used for zeros when the peak array indicates no activity).

- Time vector: This single column array contains the exact time for each peak row in the peak array.

A more detailed description of the data acquisition software can be found in Section 5.3 of [4].

3.4 Control Software

The control software written for the wheelhouse computer, performs the setup, display and storage functions for the system. It consists of approximately 450 lines of HP85 specific, BASIC code.

It is designed to allow easy interaction between the operator and data acquisition system as well as to provide a reliable environment for data storage.

The major tasks performed by this software are as follows:

- Initializes and/or retrieves from mass storage, system operating parameters (e.g. test number, threshold values, status of each channel).

- Transmits the codes to the Z80 computer in order to initiate data collection.

- Receives the data set from the Z80 computer via a serial link.

- On completion of data receipt, immediately re-initiates data collection.

- Processes and displays data as follows:
  - zero corrects 'average' array (i.e. automatic zero setting).
  - converts digital values into strain levels.
  - determines level of activity in comparison to threshold settings and stores either a full data set or the 'average' array. This allows optimal storage of useful data (see below)
  - displays strain levels and channel status to operator
  - informs operator of data storage activity.

Two pre-set operator controlled thresholds were introduced in order to limit the storage of near-zero data. A lower threshold was set to differentiate between ice loads and wave loads and/or gauge drift. An upper threshold was set to differentiate between very minor ice loads and significant impacts. It was felt that the minor ice loads (between the lower and upper threshold) would only involve loading one panel and would not require the storage of a full matrix of information. If during the eight minute measurement period, the data exceeds the lower threshold, the average values of each gauge are stored in an array. This allows checking of drift, zeros etc. If the data exceeds the high threshold, the peak values together with all simultaneous readings are stored in an array (the Peak Array). This approach keeps the data storage to a minimum. In fact, very few measurements were made between the lower and upper threshold. All wave loads were below the lower threshold and nearly all ice loads were above the upper threshold.

At almost any point during the execution of the above tasks, the operator may choose to do any of the following, with the aid of 'soft keys':

- Update the 'zero' array, if icebreaking activity is low.

- Raise or lower data storage thresholds.

- Change status of any channel (includes or eliminates channel from storage decision processes).

- Obtain a hard copy of average strain levels from latest data set.

- Cause an orderly shut down of system.

Error trapping and recovery routines are located within the software and ensure that the system can be operated successfully without the need for detailed knowledge of computers.

4. MEASUREMENT SYSTEM

4.1 Design Approach

As described in detail in the first phase report [4] the instrumented panel was designed to measure coverage pressures on sub-panels of approximately 0.108 m^2 each; these areas being approximately equal to the frame spacing squared.

This was achieved by installing shear strain transducers on the structural members of the hull as illustrated by Figure 4.1. For the second phase project additional transducers were installed to increase the number of sub-panels from 30 to 36.

Sub-panel loads and average pressures were derived by calculating differences in shear stress and hence shear loads between different points on the structural members of the panel frame. Cross-over effects resulting from the connections of the frame members to the shell plating were taken into account by "off-diagonal" terms in a calibration matrix. The calculation of ice pressure is based on the formula:

$$\{P\} = [K] \begin{Bmatrix} \Delta\varepsilon \\ \cdot \\ \cdot \\ \cdot \end{Bmatrix} \qquad (4.1)$$

$\{P\}$ = vector of ice pressures

$[K]$ = matrix of calibration coefficients

$\begin{Bmatrix} \Delta\varepsilon \\ \cdot \\ \cdot \\ \cdot \end{Bmatrix}$ = vector of strain differences across each ice panel.

The terms in the matrix [K] can be derived from a finite element model of the structure, verified by a physical calibration. Problems with the F.E. model resulted in the direct use of the physical calibration to determine [K]. This will be explained later.

4.2 Finite Element Modelling

Finite element analysis was used to develop the ice pressure calibration matrix [K]. Figure 4.1 shows an idealized view of the structure. The measurement scheme assumes that the average pressure on a single ice panel (e.g. bounded by a, a', b, b' in Figure 4.1) can be directly related to the shear strain difference across the panel. This makes the reasonable assumption that between shear measurement points, the frames have constant cross sections. To determine the values of the constants in the [K] matrix, the finite element model shown in Figure 4.2 was developed. As is normal, a trade-off between the degree of refinement of the model and cost was required, and use was made of a desktop computer based F.E. program known as FESDEC.

The main frames, web frame, stringer and shell plating were modelled with plate elements. The boundary framing was modelled with beam elements. In this phase, the detail in the model was expanded to include plate elements for the web of the instrumented frames, as well as for the numerous brackets which are attached to the frames. The model, however, assumed linear response throughout.

In developing an instrumentation system like this one, there are two opportunities to check the validity of the finite element model. The first is to perform a physical calibration which is also simulated in the F.E. model. If the results compare well then confidence in the F.E. model is built and the calibration constants which are derived from it may be used. The second check comes when these derived calibration constants are used to calculate ice pressures, and the results assessed against the available knowledge of ice pressures.

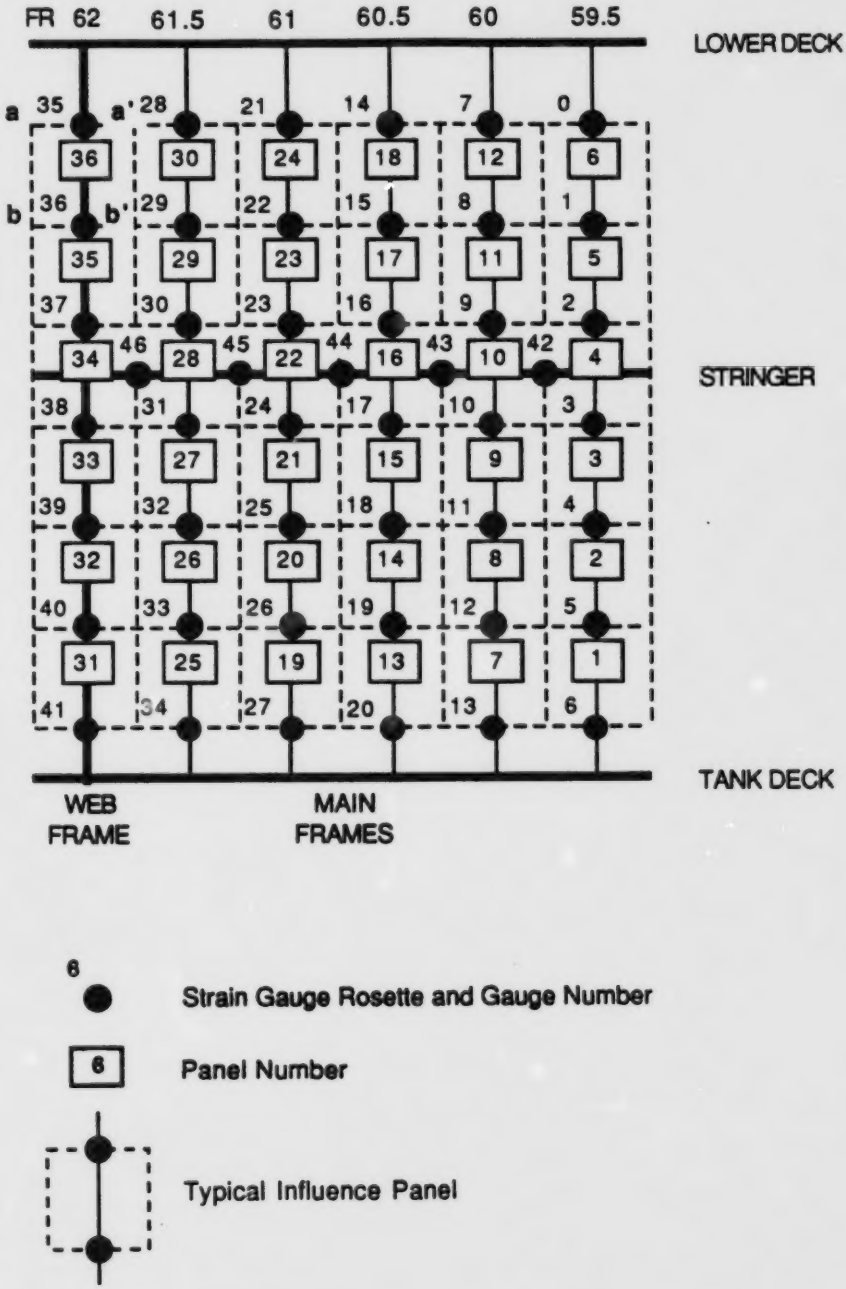
The following section describes the physical calibration and compares it's results to that of the F.E. model. Unfortunately, the comparison is poor. (Note: these results are the best that could be achieved after several checks and refinements of the F.E. model). Because of these poor results, no use could be made of the F.E. model in developing an ice pressure algorithm. The ice pressure algorithm was based on the physical calibration as will be described in Section 4.4

The inability of the F.E. model to match the physical calibration is of great concern. The validity of the F.E. method has long been established and is fundamentally beyond question. The problem in this case lies in the selection of the finite element types and in the ability of those element types to model the problem faced here.

The source of the lack of agreement between the F.E. model and the physical calibration has been further studied. Some general conclusions have been reached, although a number of specific concerns

Figure 4.1

Strain Gauge Locations on Idealized View of Ice Load Panel



remain. A discussion of the source of the disagreement is presented in Appendix F (Behaviour and Modelling of Tilted Angle Sections). The main conclusions of the investigation are:

- Tilted angle sections are subject to substantial torsion when laterally loaded. This is due to the eccentricity between the load and the shear centre of the section.

- Angles are open sections which tend to warp when a torsion is applied. The warping causes a shear stress which, like the shear stresses directly due to the lateral load, can be sensed by a strain gauge.

- The finite element program FESDEC does not model warping behaviour and was therefore incapable of reproducing the correct shear stresses.

- Warping is generally a linear-elastic problem. It is however a very complex 3D stress problem which FESDEC (and possibly many other F.E. models) does not handle. Non-linear behaviour would result if the warping deflections were large.

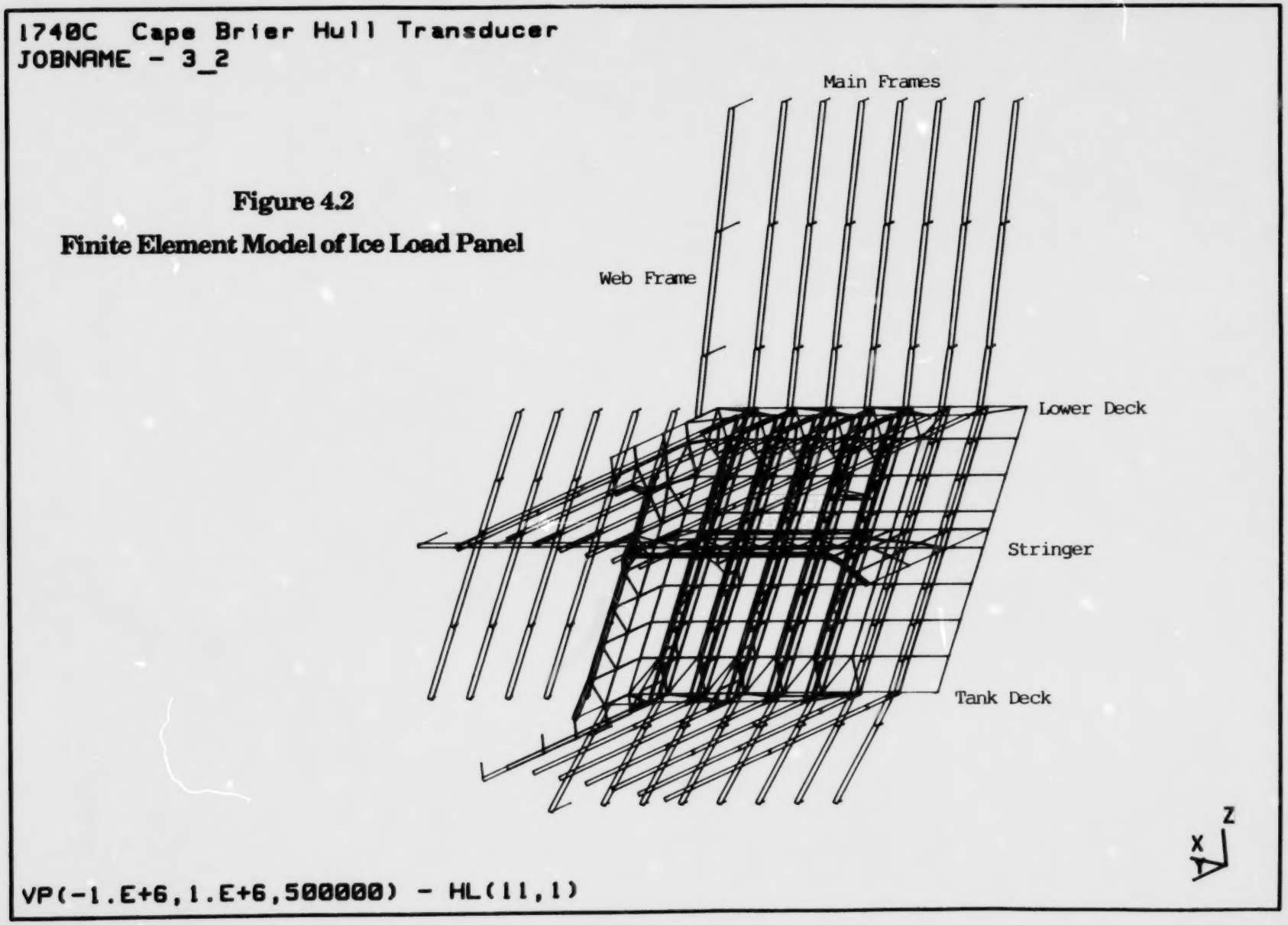


Figure 4.2

Finite Element Model of Ice Load Panel

4.3 Physical Calibration

The physical calibration procedure developed in Phase I [4] was repeated in this project. A hydraulic ram was used to pull inward on the back of the main frames with a measured load. The hydraulic cylinder was anchored at the overhead deck at the ship's centerline. In this way point loads of up to 5 tonnes were applied to six of the ice panels. Figure 4.3 illustrates the calibration load application points. The calibration set-up is described in detail in the Phase I report [4].

Two physical calibrations were performed in September 1986 and February 1987. The results are presented in Appendix A along with a table of differences. There is a difference between the two calibrations which, at its worst, is less than 20% of the maximum absolute strain. This difference is primarily caused by inaccuracies in the load application mechanism. Just prior to the first calibration, the hydraulic ram, jack, transducer and attachments were stolen and had to be replaced at short notice. Therefore, there is more confidence with the second calibration, and all comparisons between the physical calibration and the F.E. model will use the results from the second calibration.

Table 4.1a shows the shear strains, for a unit calibration load applied at point 1U (see Figure 4.3). These values are calculated for each gauge location using the F.E. model. Table 4.1b shows the regressed measurements taken from the second calibration at point 1U. The data is then normalized to a unit load.

In general, the results are similar. However, the calculated strains are sometimes not as 'distinct' as the measured strains. The F.E. model shows a gradual shear-difference change on the loaded and surrounding panels. The measured strain exhibits a sudden change as is shown in Table 4.1b. These effects are observed in the panels around the lower deck, the tank deck and the stringer, and may have been due to boundary effects.

Table 4.1c shows the percentage difference between the physical calibration and the F.E. model. This percent difference is calculated by dividing the strain difference by the maximum absolute strains calculated using the F.E. model. Although the average absolute percent difference is only 4.7% with a standard deviation of 11.5%, these values are biased because of a large number of small differences in gauges which are near zero. The numbers which should be compared are those near the calibration point, which range up to a difference of 72% (although the mean difference for those panels either on or adjacent to the frame calibrated is 2.4% with a standard deviation of 19.4%).

Tables 4.2 through 4.6 compare the F.E. model to the measured strains for the remaining calibration points. All of the other calibration points produce similar results as point 1U. In examining these results, it was found that gauges 26 and 33 had their signs reversed. Therefore in the data analysis, the signs of these two gauges were changed.

Figure 4.3

Location of Calibration Loads

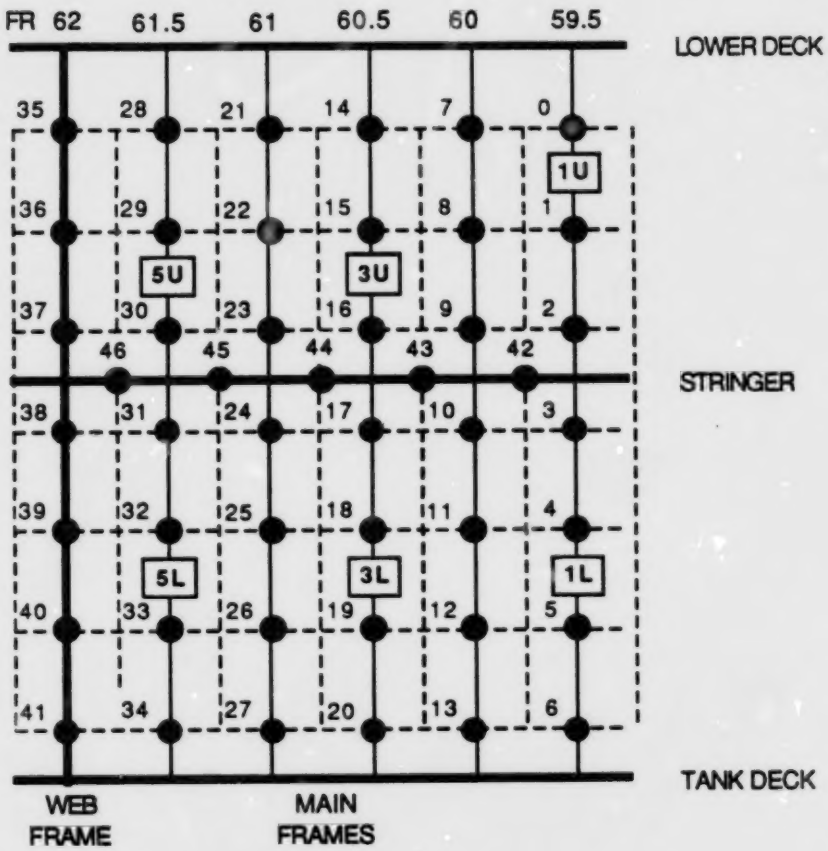


Table 4.1
Calibration Results at Point 1U

a) Calculated: FE Model Results for Calibration Point 1U (for a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.01	-0.08	-0.01	0.00	-0.70	-9.87
0.02	-0.04	-0.15	-0.13	-0.06	▶ -0.84
0.00	-0.07	-0.37	-0.08	0.79	13.80
Stringer -0.02	-0.01	-0.10	-0.22	-0.44	
0.08	0.06	0.34	0.09	-0.18	-1.03
0.06	0.03	0.12	0.05	-0.15	-0.83
0.05	0.08	0.20	0.12	-0.15	-1.17
0.05	0.05	0.22	0.06	-0.11	-1.40

b) Measured: Physical Calibration for Point 1U, Performed on Feb. 23, 1987 2nd Calibration (normalized to a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.01	-0.08	0.07	-0.08	-0.15	-8.19
0.28	-0.06	0.19	-0.26	-0.88	▶ 4.43
0.16	-0.11	0.11	-0.26	-0.18	3.92
Stringer 0.63	0.22	0.37	0.61	0.50	
0.00	0.03	0.15	0.16	0.19	-0.23
-0.17	0.08	0.12	0.18	0.19	-0.27
-0.12	-0.07	-0.15	0.19	0.15	-0.26
-0.14	0.11	0.15	0.18	0.15	-0.27

c) Percent Difference between the Physical Calibration and the FE Model

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.0%	0.0%	-0.6%	0.6%	-4.0%	-12.2%
-1.9%	0.1%	-2.5%	0.9%	5.9%	-38.2%
-1.2%	0.3%	-3.5%	1.3%	7.0%	71.6%
Stringer -4.7%	-1.7%	-3.4%	-6.0%	-6.8%	
0.6%	0.2%	1.4%	-0.5%	-2.7%	-5.8%
1.7%	-0.4%	0.0%	-0.9%	-2.5%	-4.1%
1.2%	1.1%	2.5%	-0.5%	-2.2%	-6.6%
1.4%	-0.4%	0.5%	-0.9%	-1.9%	-8.2%

Absolute Average: 4.7%
Absolute Std. Dev: 11.5%

▶ - indicates load point

Table 4.2

Calibration Results at Point 1L

a) Calculated: FE Model Results for Calibration Point 1L (for a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-0.08	-0.14	0.03	-0.29	0.39	3.83
-0.11	-0.11	-0.22	-0.16	0.08	2.14
-0.20	-0.16	-0.73	-0.22	-0.91	5.31
Stringer -0.02	0.07	-0.15	-0.43	-1.20	
-0.07	0.11	0.29	0.21	0.28	-24.58
-0.06	0.06	0.25	0.07	0.31	-17.70
-0.04	0.15	0.39	0.26	0.45	▶ 8.15
-0.01	0.06	0.38	0.16	0.16	21.70

b) Measured: Physical Calibration for Point 1L, Performed on Feb. 23, 1987 2nd Calibration (normalized to a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.03	-0.15	0.18	-0.21	0.28	1.45
0.41	-0.13	0.38	-0.57	-1.04	1.31
0.45	-0.20	0.22	-0.55	0.11	0.99
Stringer 0.86	0.57	0.64	1.46	2.50	
-0.33	0.14	0.21	0.45	-0.56	-9.44
-0.32	0.07	0.14	0.32	0.03	-10.02
-0.13	-0.09	-0.21	0.15	0.71	▶ 8.72
-0.10	0.19	0.21	0.12	1.00	7.73

c) Percent Difference between the Physical Calibration and the FE Model

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-0.4%	0.0%	-0.6%	-0.3%	0.4%	9.7%
-2.1%	0.1%	-2.4%	1.7%	4.6%	3.4%
-2.6%	0.2%	-3.9%	1.3%	-4.1%	17.6%
Stringer -3.6%	-2.0%	-3.2%	-7.7%	-15.1%	
1.1%	-0.1%	0.3%	-1.0%	3.4%	-61.6%
1.1%	0.0%	0.4%	-1.0%	1.1%	-31.2%
0.4%	1.0%	2.4%	0.4%	-1.1%	-2.3%
0.4%	-0.5%	0.7%	0.2%	-3.4%	56.8%

Absolute Average: 5.5%
Absolute Std. Dev: 12.7%

▶ - indicates load point

Table 4.3

Calibration Results at Point 3U

a) Calculated: FE Model Results for Calibration Point 3U (for a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-0.24	-0.47	-0.28	-7.80	0.25	-0.24
-0.55	-0.33	-0.71	▶ -5.95	0.04	-0.15
-1.20	-0.44	-1.80	5.03	-0.82	-0.13
Stringer -0.20	-0.15	-2.36	1.14	1.64	
0.43	0.35	1.22	-0.52	0.60	0.23
0.27	0.17	0.54	-0.47	0.63	0.11
0.26	0.47	0.89	-0.65	0.38	0.10
0.37	0.26	0.90	-0.43	0.63	0.15

b) Measured: Physical Calibration for Point 3U, Performed on Feb. 23, 1987 2nd Calibration (normalized to a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.18	-0.27	0.85	-3.67	-0.19	-0.11
0.94	-0.24	0.15	▶ -6.98	-1.14	-0.50
0.94	-0.45	-0.36	10.75	0.05	-0.62
Stringer 1.41	1.49	1.74	-1.35	-1.78	
-0.49	0.30	0.58	-0.04	0.47	0.34
-0.48	0.34	0.44	-0.01	0.51	0.32
-0.44	-0.30	-0.47	0.01	0.48	0.32
-0.20	0.30	0.45	-0.04	0.45	0.33

c) Percent Difference between the Physical Calibration and the FE Model

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-5.4%	-2.6%	-14.5%	-52.9%	5.6%	-1.7%
-19.1%	-1.2%	-11.0%	13.2%	15.1%	4.5%
-27.4%	0.1%	-18.5%	-73.3%	-11.2%	6.3%
Stringer -20.6%	-21.0%	-52.6%	31.9%	43.8%	
11.8%	0.6%	8.2%	-6.2%	1.7%	-1.4%
9.6%	-2.2%	1.3%	-5.9%	1.5%	-2.7%
9.0%	9.9%	17.4%	-8.5%	-1.3%	-2.8%
7.3%	-0.5%	5.8%	-5.0%	-2.3%	-2.3%

Absolute Average: 12.3%
Absolute Std. Dev: 15.6%

▶ - indicates load point

Table 4.4

Calibration Results at Point 3L

a) Calculated: FE Model Results for Calibration Point 3L (for a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-0.33	-0.40	-0.29	3.62	0.27	-0.21
-0.48	-0.24	-0.44	2.72	0.11	-0.12
-1.27	-0.38	-1.47	3.71	-0.95	-0.18
Stringer -0.16	-0.23	-2.26	1.16	1.48	
0.10	0.25	1.33	-25.40	0.08	0.23
-0.02	0.11	0.36	▶-18.58	0.42	0.12
0.01	0.37	0.81	20.42	0.55	0.16
0.16	0.23	0.48	14.50	1.26	-0.11

b) Measured: Physical Calibration for Point 3L, Performed on Feb. 23, 1987 2nd Calibration (normalized to a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.40	-0.2[illegible]	0.09	1.15	0.33	-0.13
0.99	-0.26	0.53	1.05	-0.82	-0.46
1.08	-0.46	0.46	1.28	0.10	-0.47
Stringer 1.06	1.72	3.23	-1.04	-1.80	
-0.42	0.37	-0.17	-7.59	-0.71	0.48
-0.47	0.27	-0.33	▶-9.84	-0.46	0.39
-0.33	-0.10	-0.50	10.33	0.48	0.19
-0.38	0.06	0.85	8.39	1.39	-0.02

c) Percent Difference between the Physical Calibration and the FE Model

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-2.9%	-0.4%	0.8%	9.7%	-0.2%	-0.3%
-5.8%	0.1%	-3.8%	6.6%	3.7%	1.3%
-9.3%	0.3%	-7.6%	9.6%	-4.1%	1.1%
Stringer -4.8%	-7.7%	-21.6%	8.7%	12.9%	
2.0%	-0.5%	5.9%	-70.1%	3.1%	-1.0%
1.8%	-0.6%	2.7%	-34.4%	3.5%	-1.1%
1.3%	1.9%	5.2%	39.7%	0.3%	-0.1%
2.1%	0.7%	-1.5%	24.1%	-0.5%	-0.4%

Absolute Average: 7.0%
Absolute Std. Dev: 12.6%

▶ - indicates load point

Table 4.5

Calibration Results at Point 5U

a) Calculated: FE Model Results for Calibration Point 5U (for a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-0.64	-7.70	0.20	-0.41	0.00	-0.12
-1.53	▶-5.88	-0.54	-0.29	0.01	-0.05
-3.45	5.07	-1.49	-0.29	-0.57	-0.08
Stringer -1.39	0.13	0.65	0.90	0.52	
1.13	-0.53	1.15	0.36	0.36	0.08
0.57	-0.53	0.67	0.20	0.38	0.04
0.58	-0.57	0.82	0.34	0.29	0.06
0.93	-0.36	0.81	0.24	0.38	0.06

b) Measured: Physical Calibration for Point 5U, Performed on Feb. 23, 1987 2nd Calibration (normalized to a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.45	-4.28	0.71	-0.22	-0.01	-0.03
1.55	▶-2.54	0.46	-0.38	-0.47	-0.18
1.64	11.47	-0.14	-0.56	0.05	-0.23
Stringer 3.08	-0.33	-1.23	-1.06	-0.56	
-0.73	-0.14	0.55	0.29	0.22	0.16
-0.97	-0.23	0.41	0.33	0.26	0.14
-0.85	0.15	-0.42	0.36	0.24	0.11
-0.98	-0.20	0.36	0.36	0.24	0.15

c) Percent Difference between the Physical Calibration and the FE Model

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-14.2%	-44.4%	-6.6%	-2.5%	0.1%	-1.2%
-40.0%	-43.4%	-13.0%	1.2%	6.2%	1.7%
-66.1%	-83.1%	-17.5%	3.5%	-8.1%	1.9%
Stringer -58.1%	6.0%	24.4%	25.5%	14.0%	
24.2%	-5.1%	7.8%	0.9%	1.8%	-1.0%
20.0%	-3.9%	3.4%	-1.7%	1.6%	-1.3%
18.6%	-9.4%	16.1%	-0.3%	0.6%	-0.6%
24.8%	-2.1%	5.8%	-1.6%	1.8%	-1.2%

Absolute Average: 13.6%
Absolute Std. Dev: 18.8%

▶ - indicates load point

Table 4.6

Calibration Results at Point 5L

a) Calculated: FE Model Results for Calibration Point 5L (for a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-0.44	3.66	0.19	-0.42	0.05	-0.07
-1.41	2.71	-0.50	-0.25	0.01	-0.04
-2.88	3.64	-1.53	-0.27	-0.52	-0.05
Stringer -1.37	0.09	0.64	0.78	0.44	
1.24	-25.08	0.86	0.37	0.31	0.06
0.53	▶ -18.17	0.26	0.21	0.33	0.02
0.44	20.75	1.00	0.37	0.27	0.04
0.48	14.79	1.35	0.24	0.30	0.02

b) Measured: Physical Calibration for Point 5L, Performed on Feb. 23, 1987 2nd Calibration (normalized to a load of 1 Ton) (Values in Microstrain)

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.25	1.13	0.00	-0.22	0.05	-0.05
1.28	0.66	0.35	-0.53	-0.57	-0.21
1.88	1.68	0.46	-0.56	0.05	-0.25
Stringer 3.98	-0.59	-1.35	-0.79	-0.48	
-0.47	-8.35	-0.58	0.43	0.18	0.13
-0.45	▶ -10.21	-0.60	0.45	0.20	0.12
-0.82	-9.55	-0.58	0.22	0.19	0.08
-1.03	7.55	1.52	-0.02	0.22	0.11

c) Percent Difference between the Physical Calibration and the FE Model

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-2.8%	10.1%	0.8%	-0.8%	0.0%	-0.1%
-10.7%	8.2%	-3.4%	1.1%	2.3%	0.7%
-19.0%	7.8%	-7.9%	1.2%	-2.3%	0.8%
Stringer -21.3%	2.7%	7.9%	6.3%	3.7%	
6.8%	-66.7%	5.7%	-0.2%	0.5%	-0.3%
3.9%	-31.7%	3.4%	-1.0%	0.5%	-0.4%
5.0%	120.8%	6.3%	0.6%	0.3%	-0.2%
6.0%	28.9%	-0.7%	1.0%	0.3%	-0.4%

Absolute Average: 8.8%
Absolute Std. Dev: 20.2%

▶ - indicates load point

4.4 Ice Pressure Algorithm

The purpose of the ice pressure algorithm is to convert the 47 measured strains into 36 ice pressures. The procedure followed is shown schematically in Figure 4.4.

The first step is to convert the shear strains into a shear force. This step is necessary because the sectional properties of the main frames differ from those of the web frame and stringer. If the sectional properties of all of the gauged members were identical, then it would be possible to omit this step. The shear force at each gauge is calculated from:

$$V = \frac{I\ t\ E}{2\ Q\ (1+\nu)}\ \varepsilon \qquad (4.2)$$

(refer to nomenclature at the beginning of the report)

which can be simplified to:

$$V = C_o\ \varepsilon \qquad (4.3)$$

In equation 4.3, the constant Co has the following values based on the physical properties of the sections:

0.1827 kN/με for the main frames
0.5485 kN/με for the stringer
0.8548 kN/με for gauge 35 on web frame
0.5705 kN/με for gauge 36 on web frame
0.4434 kN/με for the remainder of the web frame.

The second step is to take the 47 shear forces and calculate 36 shear force differences (or shear force sums). For all panels without the stringer, this is done by simply subtracting the shear force directly below the panel from the shear force above the panel. For example, for panel number 21 (see the panel description in Figure 4.1) the shear force difference is calculated as follows:

$$\Delta V = V_{24} - V_{25} \qquad (4.4)$$

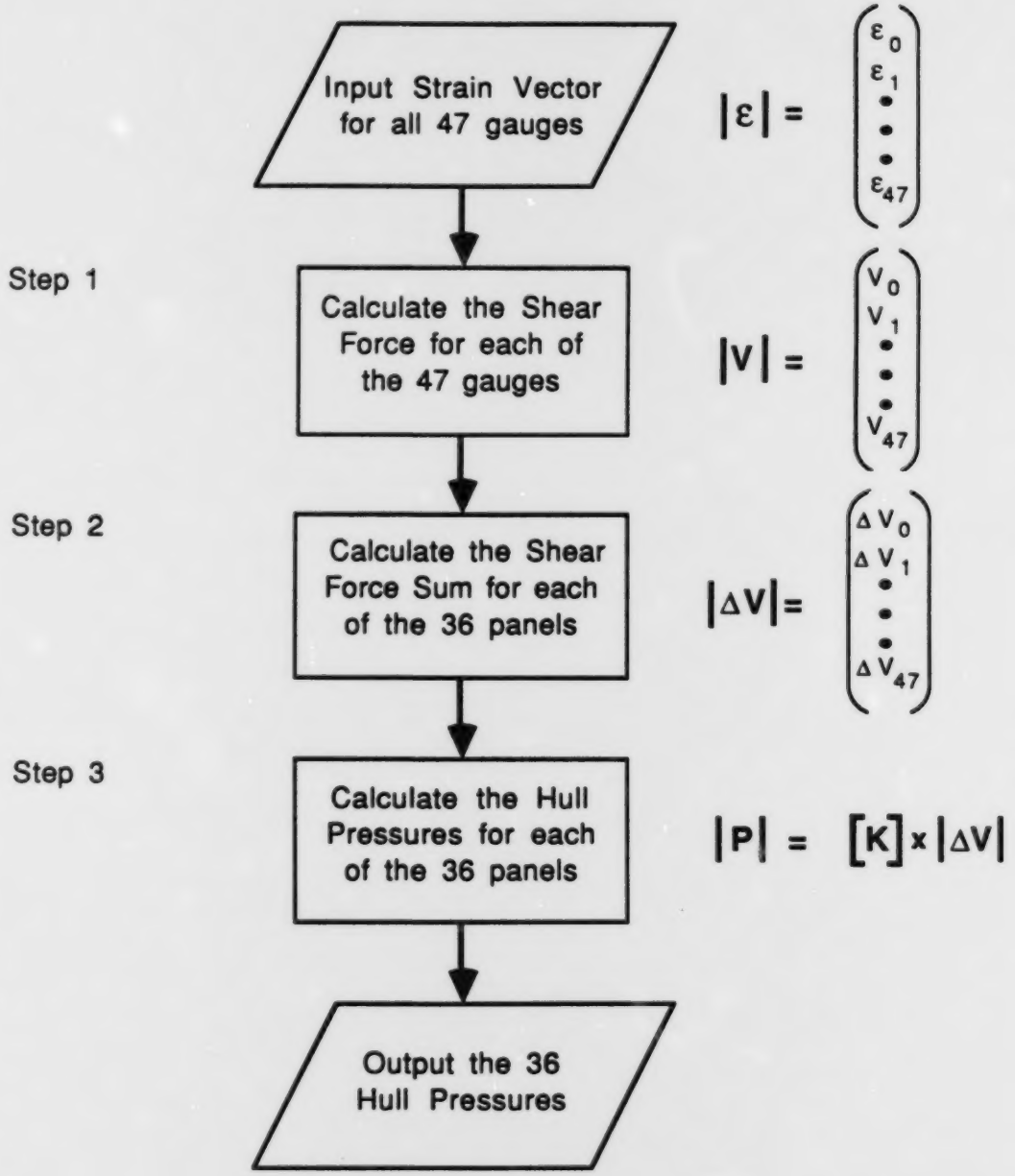
where the suffix refers to the gauge number.

However, for those panels which include the stringer, the shear force difference on the stringer is added to the shear force difference on the frame. For example, for panel number 22, the shear force is calculated as follows:

$$\Delta V = V_{23} - V_{24} + V_{44} - V_{45} \qquad (4.5)$$

Figure 4.4

Ice Load Algorithm


Input Strain Vector for all 47 gauges
|ε| = (ε0, ε1, ..., ε47)
Step 1
Calculate the Shear Force for each of the 47 gauges
|V| = (V0, V1, ..., V47)
Step 2
Calculate the Shear Force Sum for each of the 36 panels
|ΔV| = (ΔV0, ΔV1, ..., ΔV47)
Step 3
Calculate the Hull Pressures for each of the 36 panels
|P| = [K] x |ΔV|
Output the 36 Hull Pressures

For panels 3 and 33 (which are also on the stringer but only have a stringer gauge on one side of the panel), the shear difference along the stringer is not used. For these two panels, the results will still be good if the transfer function can accurately correct for this configuration although these two panels will be more sensitive to the shape of the applied load.

The final step of the ice load algorithm is to multiply the shear force difference vector (or the shear force sum vector) by a transfer function. The transfer function converts a force measured in the structure into an ice load acting on the structure. If the ice panels were "ideal", it would be possible to take the shear force sum for each panel and multiply it by a single constant to obtain the ice pressure on that panel. For example:

$$P_i = K_i \cdot \Delta V_i \tag{4.6}$$

or in matrix form:

$$\begin{vmatrix} P_1 \\ P_2 \\ \cdot \\ \cdot \\ \cdot \\ P_{36} \end{vmatrix} = \begin{vmatrix} K_1 & 0 & \cdots & 0 \\ 0 & K_2 & \cdots & 0 \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ 0 & 0 & \cdots & K_{36} \end{vmatrix} \begin{vmatrix} \Delta V_1 \\ \Delta V_2 \\ \cdot \\ \cdot \\ \cdot \\ \Delta V_{36} \end{vmatrix} \tag{4.7}$$

However, a load applied on a given panel will cause a shear force sum on other panels since the 'panels' are, in fact, part of a continuous structure. To correct for this, non-zero terms are used in the off-diagonal elements of the transfer function (or 'K') matrix. Therefore, the actual equation (4.7) is of the form:

$$\begin{vmatrix} P_1 \\ P_2 \\ \cdot \\ \cdot \\ \cdot \\ P_{36} \end{vmatrix} = \begin{vmatrix} K_{1,1} & K_{1,2} & \cdots & K_{1,36} \\ K_{2,1} & K_{2,2} & \cdots & K_{2,36} \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ K_{36,1} & K_{36,2} & \cdots & K_{36,36} \end{vmatrix} \begin{vmatrix} \Delta V_1 \\ \Delta V_2 \\ \cdot \\ \cdot \\ \cdot \\ \Delta V_{36} \end{vmatrix} \tag{4.8}$$

To determine the values in the 'K' matrix (which is a pressure per unit shear force sum), an 'L' matrix (which is a shear force sum per unit pressure) was defined as follows:

$$\begin{vmatrix} \Delta V_1 \\ \Delta V_2 \\ . \\ . \\ . \\ \Delta V_{36} \end{vmatrix} = \begin{vmatrix} L_{1,1} & L_{1,2} & \cdots & L_{1,36} \\ L_{2,1} & L_{2,2} & \cdots & L_{2,36} \\ . & . & & . \\ . & . & & . \\ . & . & & . \\ L_{36,1} & L_{36,2} & \cdots & L_{36,36} \end{vmatrix} \begin{vmatrix} P_1 \\ P_2 \\ . \\ . \\ . \\ P_{36} \end{vmatrix} \qquad (4.9)$$

The 'L' matrix is determined by applying a unit pressure to each panel individually, and calculating the shear force sum for each panel. The shear force sum vector will become one column in the 'L' matrix. By repeating this procedure for each of the 36 panels, the 'L' matrix is formed. While it was intended to use the F.E. model to calculate the 'L' matrix, because of the problems with the F.E. model discussed in Section 4.3, it was decided to use the calibration data to create the 'L' matrix. At best, the calibration data provides 6 of the 36 columns of the 'L' matrix. By identifying patterns in the calibration data and by using simple beam theory, it was possible to fill the remaining numbers of the 'L' matrix. The values in the 'L' matrix is given in Appendix B.

The 'K' matrix is obtained by inverting the 'L' matrix. Once the 'K' matrix is found, equation 4.8 is used to calculate the ice pressure acting on the hull. The 'K' matrix obtained using the calibration data produced significantly better results than the 'K' matrix obtained from the F.E. model.

Once the collected data was processed using this algorithm, it was found that two of the forty-seven gauges malfunctioned during the tests. Both of these gauges were at the bottom of the instrumented section of the hull, and as such only affected two panels. However, because data from those two panels would cause errors in other panels due to the "influence" between panels, the off-diagonal terms in the 'L' matrix for these panels were set to zero.

5. DATA COLLECTION

5.1 Overview

Due to a combination of ice conditions and ship schedule there was only one voyage into the ice in 1987. However, the trip was quite successful, with ten tapes of very good data being recorded.

The system performed well on this trip. Due to last minute space restrictions on the vessel, only one person (Mr. Steve Eishenhover of MacLaren Plansearch, an ex-AES ice observer, on contract to this project) was able to go on the trip. The operator/ice observer monitored the system and kept a log of ice conditions.

5.2 Navigation Record and Environmental Description

The CAPE BRIER first met ice southeast of Cape Breton on February 25th. This was only a tongue of ice extending out of the Gulf of St. Lawrence. She next met ice just southeast of St. John's when she first entered the Labrador pack around 3 p.m. on February 26th. She stayed in ice until the afternoon of the 27th, when she left the Labrador pack on the seaward side and proceeded north in open water. She again re-entered the pack on March 5th, and again crossed the pack to the east of St. John's.

Figures 5.1 and 5.2 show AES ice charts for February 22nd and March 4th. The ship's track is marked as a wide solid line. Ice conditions are shown in the standard AES ice egg format.

Table 5.1 lists the ship's position, heading, speed and ice conditions for time spent in ice.

FIGURE 5.1

ICE CONDITIONS FOR FEBRUARY 22, 1987

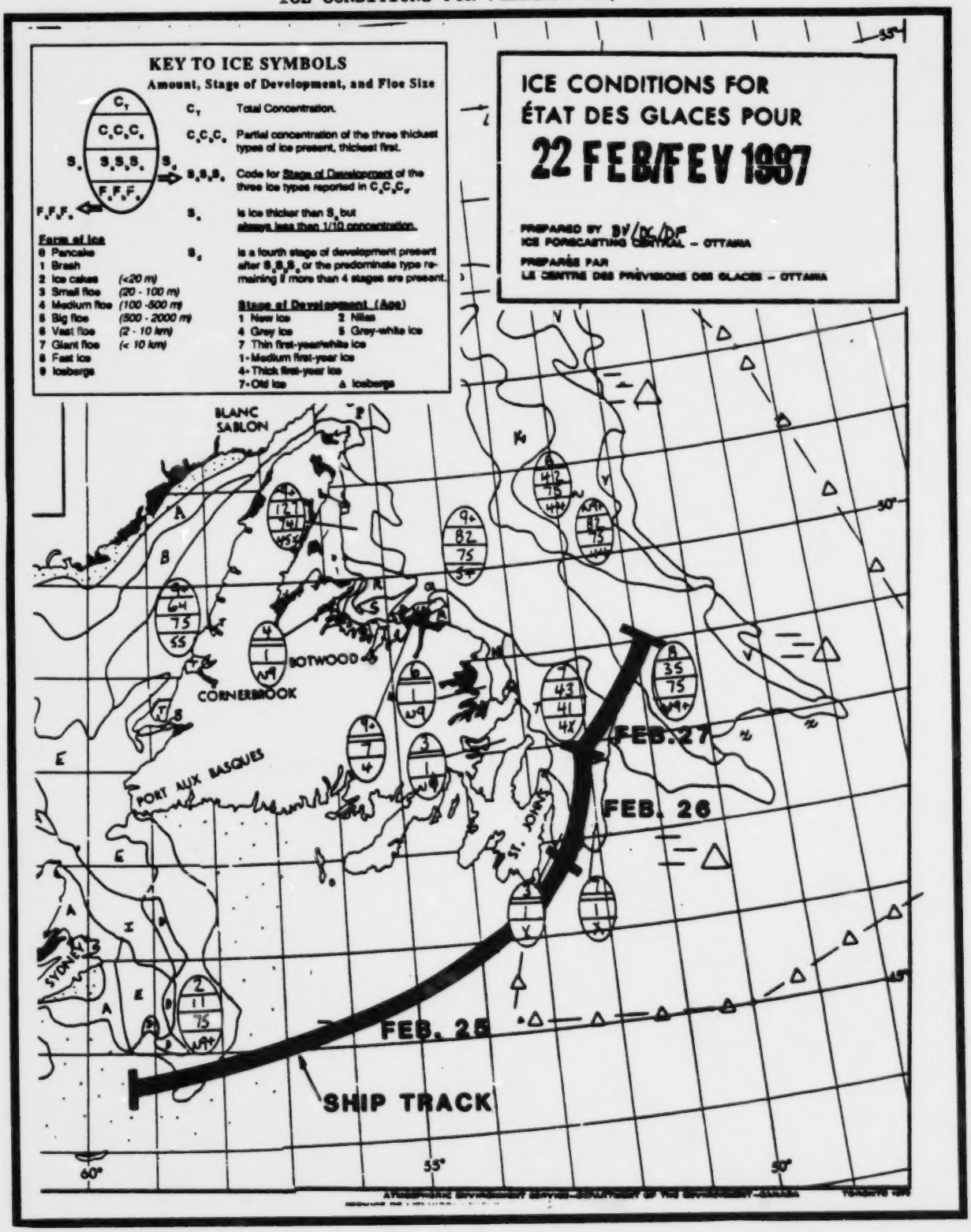

KEY TO ICE SYMBOLS
Amount, Stage of Development, and Floe Size
C_T Total Concentration.
$C_aC_bC_c$ Partial concentration of the three thickest types of ice present, thickest first.
$S_aS_bS_c$ Code for Stage of Development of the three ice types reported in $C_aC_bC_c$.
S_b Is ice thicker than S_a but always less than 1/10 concentration.
S_d Is a fourth stage of development present after $S_aS_bS_c$ or the predominate type remaining if more than 4 stages are present.
Form of Ice
0 Pancake
1 Brash
2 Ice cakes (<20 m)
3 Small floe (20 - 100 m)
4 Medium floe (100 -500 m)
5 Big floe (500 - 2000 m)
6 Vast floe (2 - 10 km)
7 Giant floe (< 10 km)
8 Fast ice
9 Iceberge
Stage of Development (Age)
1 New ice
2 Nilas
4 Grey ice
5 Grey-white ice
7 Thin first-year/white ice
1 - Medium first-year ice
4 - Thick first-year ice
7 - Old ice
Δ Iceberge
ICE CONDITIONS FOR
ÉTAT DES GLACES POUR
22 FEB/FEV 1987
PREPARED BY BY/DK/DF
ICE FORECASTING CENTRAL – OTTAWA
PRÉPARÉE PAR
LE CENTRE DES PRÉVISIONS DES GLACES – OTTAWA
BLANC SABLON
BOTWOOD
CORNERBROOK
PORT AUX BASQUES
STONEY
FEB. 27
FEB. 26
FEB. 25
SHIP TRACK
60°
55°
50°
45°

FIGURE 5.2

ICE CONDITIONS FOR MARCH 4, 1987

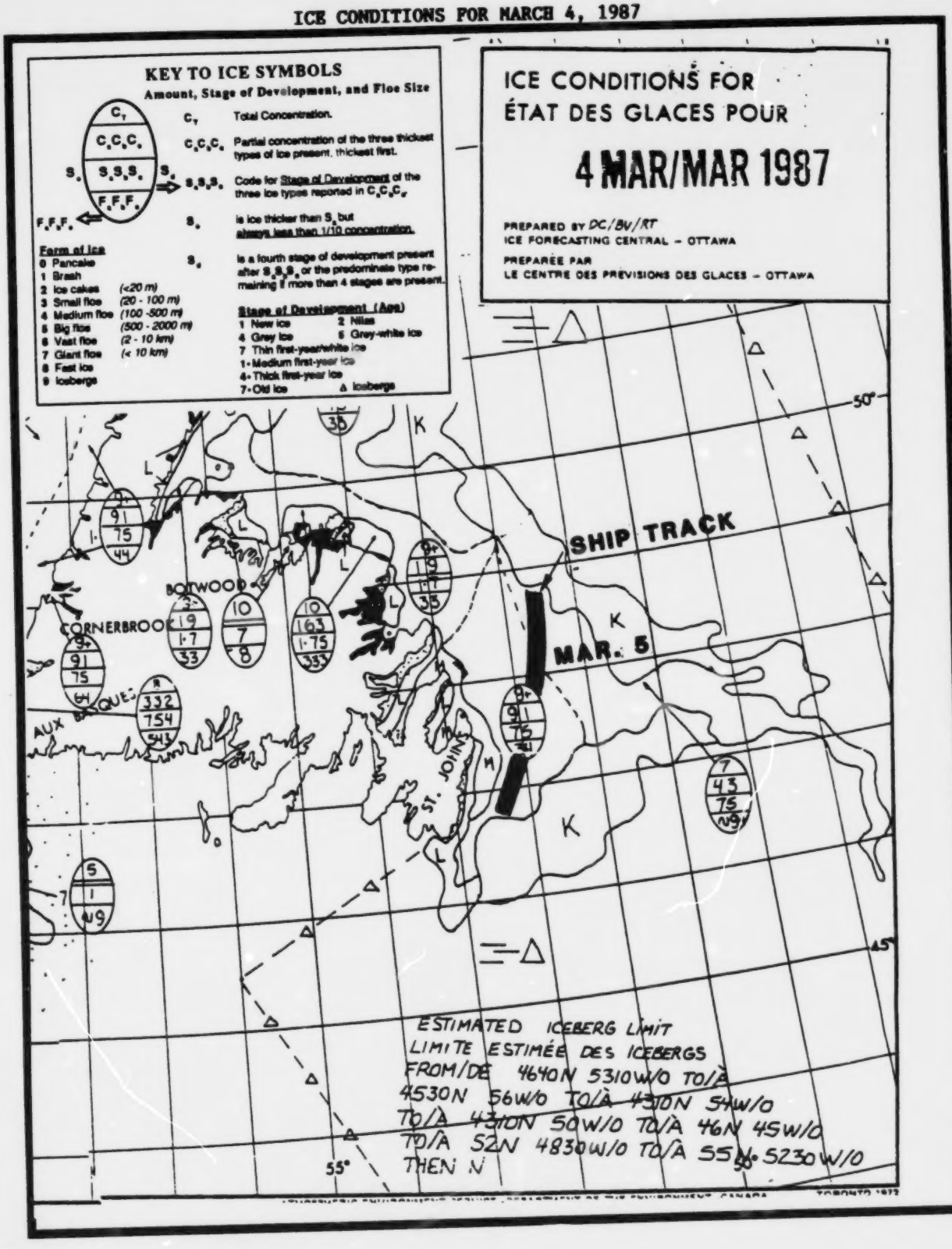

KEY TO ICE SYMBOLS
Amount, Stage of Development, and Floe Size
C_T Total Concentration.
$C_aC_bC_c$ Partial concentration of the three thickest types of ice present, thickest first.
$S_aS_bS_c$ Code for Stage of Development of the three ice types reported in $C_aC_bC_c$.
S_a is ice thicker than S_b but always less than 1/10 concentration.
S_d is a fourth stage of development present after $S_aS_bS_c$ or the predominate type remaining if more than 4 stages are present.
Form of Ice
0 Pancake
1 Brash
2 Ice cakes (<20 m)
3 Small floe (20 - 100 m)
4 Medium floe (100 -500 m)
5 Big floe (500 - 2000 m)
6 Vast floe (2 - 10 km)
7 Giant floe (< 10 km)
8 Fast ice
9 Iceberge
Stage of Development (Age)
1 New ice
2 Nilas
4 Grey Ice
5 Grey-white ice
7 Thin first-year/white ice
1- Medium first-year ice
4- Thick first-year ice
7- Old ice
Δ Iceberge
ICE CONDITIONS FOR
ÉTAT DES GLACES POUR
4 MAR/MAR 1987
PREPARED BY DC/BV/RT
ICE FORECASTING CENTRAL - OTTAWA
PREPARÉE PAR
LE CENTRE DES PRÉVISIONS DES GLACES - OTTAWA
SHIP TRACK
MAR. 5
BOTWOOD
CORNERBROOK
AUX
QUE
ST. JOHN
50°
45°
55°
ESTIMATED ICEBERG LIMIT
LIMITE ESTIMÉE DES ICEBERGS
FROM/DE 4640N 5310W/O TO/À
4530N 56W/O TO/À 43ON 54W/O
TO/À 43ON 50W/O TO/À 46N 45W/O
TO/À 52N 4830W/O TO/À 55N 5230W/O
THEN N

TABLE 5.1 - ENVIRONMENTAL LOG

DAY	DATE / TIME	LATITUDE	LONGITUDE	HEADING	SPEED	NEW ICE	YOUNG ICE	THIN FIRST YEAR ICE	MEDIUM FIRST YEAR ICE	AIR TEMP.	WATER TEMP.	COMMENTS
1	Feb-25-87 5:00	44° 38'	59° 38'	283°	1.0 KTS			6 /10	4 /10	-1.7 °C		-10/10 ths Consolidated pack ice visible in all quads
												-snow coverage up to 5 cm
												-thin first year ice - ice cake floes
												-medium first year ice - small floes
								9 /10			-2.2 °C	
1	Feb-25-87 5:50	44° 34'	59° 37'									-small strip of young ice
1	Feb-25-87 6:20			086°	11.9 KTS							-sitting calm in water with no ice - update zero's
1	Feb-25-87 6:47				0.0 KTS							-strip of grey ice in small ice cakes
1	Feb-25-87 7:13			097°	12.1 KTS		6 /10					-strip of grey ice / grey white ice in small ice cakes
1	Feb-25-87 7:26			092°	12.2 KTS		5 /10			-1.4 °C	-2.0 °C	-in open water - shut system down
1	Feb-25-87 8:01	44° 30'	59° 06'									-cutting around cape race
2	Feb-26-87 15:03									-1.4 °C	-1.2 °C	-3/10 ths Grease ice and 5/10 ths light Nilas ice
2	Feb-26-87 15:12			046°	10.5 KTS	5 /10						in a small strip approx. 1 km wide
												-28 KTS winds from north east with 3.5 m sig. wave height and 5.9 m max wave height (no swell wave)
												-5 mile visibility in light rain and snow
												-3/10 ths Grease ice and 3/10 ths light Nilas ice
2	Feb-26-87 16:06			040°	11.0 KTS	6 /10	2 /10					in a small strip
												-no ice in sight - shut system down
2	Feb-26-87 16:33						8 /10					-5/10 ths Grey ice - 3/10 ths grey-white ice
2	Feb-26-87 16:15	46° 56'	52° 31'	045°	8.5 KTS		1 /10				-0.4 °C	-in a lead, very open, in 1/10 th Brash ice
2	Feb-26-87 16:31						7 /10	2 /10				-3/10 ths Grey-white ice and 4/10 ths grey ice in
2	Feb-26-87 16:39	47° 04'	52° 21'	039°	8.0 KTS							small ice cakes
												-swell from 030° (sig. ht. 5 m)
												-out of ice
2	Feb-26-87 19:58	47° 10'	52° 11'									
3	Feb-27-87 4:44	47° 50'	51° 17'	037°	4.8 KTS		5 /10	4 /10				-first year thin ice in small floes, gray-white in small ice cakes
												-end of data tape 1, start of data tape 2
3	Feb-27-87 4:59	47° 51'	51° 16'									-thin packed in sections (from 5/10 ths to 8/10 ths)
3	Feb-27-87 5:10						8 /10					-into small lead, update computer zeros
3	Feb-27-87 5:11											-small strip of grey ice, small ice cakes
3	Feb-27-87 5:12						7 /10					-5 cm snow cover
3	Feb-27-87 5:50			017°	5.9 KTS		6 /10	3 /10				-ice cover varying from 1/10 th to 4/10 ths
3	Feb-27-87 6:09											-grey-white and first year thin ice in ice cakes,
3	Feb-27-87 7:34	48° 08'	51° 01'	064°	7.5 KTS		6 /10	2 /10	1 /10	-2.4 °C	-1.8 °C	first year medium ice in small floes
												-no wind wave, swell wave direction 040° (sig. ht. of 6.0 m, max. ht. of 10.2 m, period 9 sec)
												-updated computer zeros
3	Feb-27-87 8:10											-grey-white ice in cakes and small ice cakes,
3	Feb-27-87 8:45			360°	5.1 KTS		6 /10	2 /10	1 /10			first year ice in small floes
												-ice conditions not changing
3	Feb-27-87 9:05	48° 13'	50° 52'	010°	5.1 KTS		6 /10	2 /10	1 /10	-2.0 °C	-1.5 °C	-no wind wave, swell wave direction 020° (sig. ht. of 6.0 m, max. ht. of 10.2 m)
												-small floes and ice cakes
								4 /10	3 /10			-small ice cakes
3	Feb-27-87 9:33						2 /10	3 /10			0.5 °C	-out of ice and into open water
3	Feb-27-87 10:05											-no ice spotted
3	Feb-27-87 10:13											-no ice spotted
4	Feb-28-87 0:00											-no ice spotted
5	Mar-1-87 0:00											-no ice spotted
6	Mar-2-87 0:00											-no ice spotted
7	Mar-3-87 0:00											-no ice spotted
8	Mar-4-87 0:00											

TABLE 5.1 CONTINUED - ENVIRONMENTAL LOG

DAY	DATE / TIME	LATITUDE	LONGITUDE	HEADING	SPEED	NEW ICE	YOUNG ICE	THIN FIRST YEAR ICE	MEDIUM FIRST YEAR ICE	AIR TEMP.	WATER TEMP.	COMMENTS
9	Mar-5-87 0:25	48° 55'	51° 20'	178°	11.3 KTS		1 /10	2 /10				-a few melt puddles, data tape #4-wrong zero
9	Mar-5-87 0:42									-3.2 °C	-0.4 °C	-updated zeros, changed threshold 10-40, wind N20
9	Mar-5-87 1:00	48° 50'	51° 21'	182°	10.0 KTS			3 /10	2 /10			-ice cakes, tape#4 off, #5 on
9	Mar-5-87 1:29											
9	Mar-5-87 1:40	48° 44'	51° 24'	196°	6.3 KTS			3 /10	6 /10			-ice cakes
9	Mar-5-87 1:44						2 /10	2 /10	2 /10			-swell wave direction 030° (sig. ht.of 2.5 m)
9	Mar-5-87 2:00	48° 42'	51° 24'	182°	8.0 KTS							
9	Mar-5-87 2:06	48° 41'	51° 24'	185°	5.8 KTS		6 /10	2 /10	1 /10			
9	Mar-5-87 2:15	48° 40'	51° 24'	211°	3.8 KTS							-in open lead , updated zeros
9	Mar-5-87 2:24						3 /10	2 /10				-ice cakes
9	Mar-5-87 3:00	48° 34'	51° 24'	186°	8.0 KTS							
9	Mar-5-87 3:10											- tape #5 off #6 on, into open water
9	Mar-5-87 4:00	48° 28'	51° 25'	182°	8.0 KTS							
9	Mar-5-87 5:00	48° 20'	51° 26'	182°	8.0 KTS							
9	Mar-5-87 6:00	48° 11'	51° 29'	186°	12.0 KTS							
9	Mar-5-87 7:00	48° 00'	51° 34'	186°	12.0 KTS							
9	Mar-5-87 7:35					4 /10	1 /10	3 /10	1 /10			
9	Mar-5-87 7:37	47° 46'	51° 38'	202°	10.0 KTS					-4.5 °C	-0.8 °C	-in open lead, updated zeros
												-ice edge to south, vis +15, wind N 15
9	Mar-5-87 8:00	47° 51'	51° 39'	188°	7.9 KTS	3 /10	4 /10					-thin strips
9	Mar-5-87 9:00	47° 39'	51° 49'	206°	8.0 KTS							
9	Mar-5-87 9:12	47° 39'	51° 46'			3 /10		4 /10	2 /10			
9	Mar-5-87 9:21			206°	8.5 KTS							
9	Mar-5-87 9:45	47° 35'	51° 51'	210°	7.9 KTS	1 /10		6 /10	2 /10	-2.6 °C	-0.9 °C	-5cm snow, tape#6 off, #7 on
9	Mar-5-87 10:00	47° 31'	51° 52'	210°	8.0 KTS							
9	Mar-5-87 10:17	47° 29'	51° 54'	212°	7.1 KTS	1 /10		6 /10	2 /10			
9	Mar-5-87 11:00	47° 26'	51° 56'	210°	7.0 KTS							
9	Mar-5-87 11:34	47° 25'	52° 03'	223°	6.3 KTS	1 /10		5 /10	4 /10			-test #34
9	Mar-5-87 12:00	47° 21'	52° 05'	220°	8.0 KTS							
9	Mar-5-87 13:00	47° 16'	52° 10'	220°	8.0 KTS							
9	Mar-5-87 13:19			214°	8.6 KTS			6 /10	4 /10	-1.6 °C		-test#44,Tape#8, cakes and small floes
9	Mar-5-87 13:57	47° 08'	52° 15'	211°	7.3 KTS		2 /10	4 /10	1 /10		-0.6 °C	-6cm snow
9	Mar-5-87 14:00	47° 08'	52° 15'	190°	6.0 KTS							
9	Mar-5-87 14:25	47° 05'	52° 16'	206°	8.0 KTS		3 /10	3 /10				-6cm snow, cakes
9	Mar-5-87 14:26											-updated zeros, test #44,tape#9
9	Mar-5-87 14:30			196°	6.5 KTS		2 /10	5 /10	2 /10			
9	Mar-5-87 15:00	47° 04'	52° 17'	190°	6.0 KTS							
9	Mar-5-87 15:50	46° 58'	52° 21'				-	-	-			-open water, tape#9 off,#10 on
9	Mar-5-87 16:00	46° 56'	52° 21'	200°	7.0 KTS							
9	Mar-5-87 17:00	46° 50'	52° 27'	220°	8.0 KTS		1 /10	5 /10	1 /10	-1.2 °C	-0.8 °C	-narrow strips, wind N 20
9	Mar-5-87 17:07						-	-	-			-open water, zeros updated
9	Mar-5-87 17:49	46° 42'	52° 38'	208°	7.1 KTS		1 /10	6 /10	2 /10	-1.4 °C		-5cm snow, wind SW 15
9	Mar-5-87 18:24						-	-	-			- Open Water , HP-85 Shut Down

6. DATA ANALYSIS

6.1 General

Data was gathered in eight-minute segments or vindovs. Whenever the measured strain exceeded the lover pre-set threshold, a complete set of readings were taken. The type of data stored depended on whether or not the upper threshold was exceeded, as described in Section 3. The two thresholds were user controllable. The lover threshold was generally set to approximately 0.5 micro strain and the upper to approximately 2.0 micro strain. In total, 105 eight-minute long data sets were collected. Seven of these sets were of averages (i.e. peak between lover and upper threshold) and the remaining 98 were of peak measurements.

6.2 Qualitative Assessment of the Data

The data is presented as a maximum/minimum value for each 'vindov' in time ordered form in the appendices. Appendix C has the rav strain plots for each of the 47 gauges, while Appendix D has the pressure plots for each of the 36 panels.

One of the ice pressure plots is shovn in Figure 6.1. Each of the bars represents one of the eight-minute vindovs. The maximum and minimum for each vindov and panel vas found and plotted. Since the instrumentation system vas designed to collect data only if there vas activity, there are periods of time vhen no data vas collected. This can be seen between February 26 and 2000 hours and February 27 at 0430 hours. Although the system vas operating continuously, there vas not sufficient ice activity to trigger the storing of data.

Each page of plots represents one frame (either a main frame or veb frame). For the rav strain plots, there are seven gauges per frame and seven plots per page. For the pressure plots, there are six panels per frame and therefore, six plots per page. The top plot represents the top gauge or panel.

Although the data in digital form lends itself to automatic reduction and analysis, in practice each data set vas scrutinized individually. By examining the rav data, the strain plots and the pressure plots, a qualitative assessment of the data vas made. The first check vas to see if the gauge measured some activity during the test period. If not, the gauge vas identified as FAILED. Two gauges failed during the trials. Particular attention vas paid to any gauge vhere the signal appeared to drift or vas clipped. Although both of these faults may produce data if corrections are made, the data has to be used cautiously. Finally, the pressure plots vere examined to determine if the pressure algorithm produced reasonable results, particularly in viev of the use of the limited calibration data to establish the pressure/strain relationship (see Section 4.4).

Figure 6.1
Hull Pressures on Frame 61.5

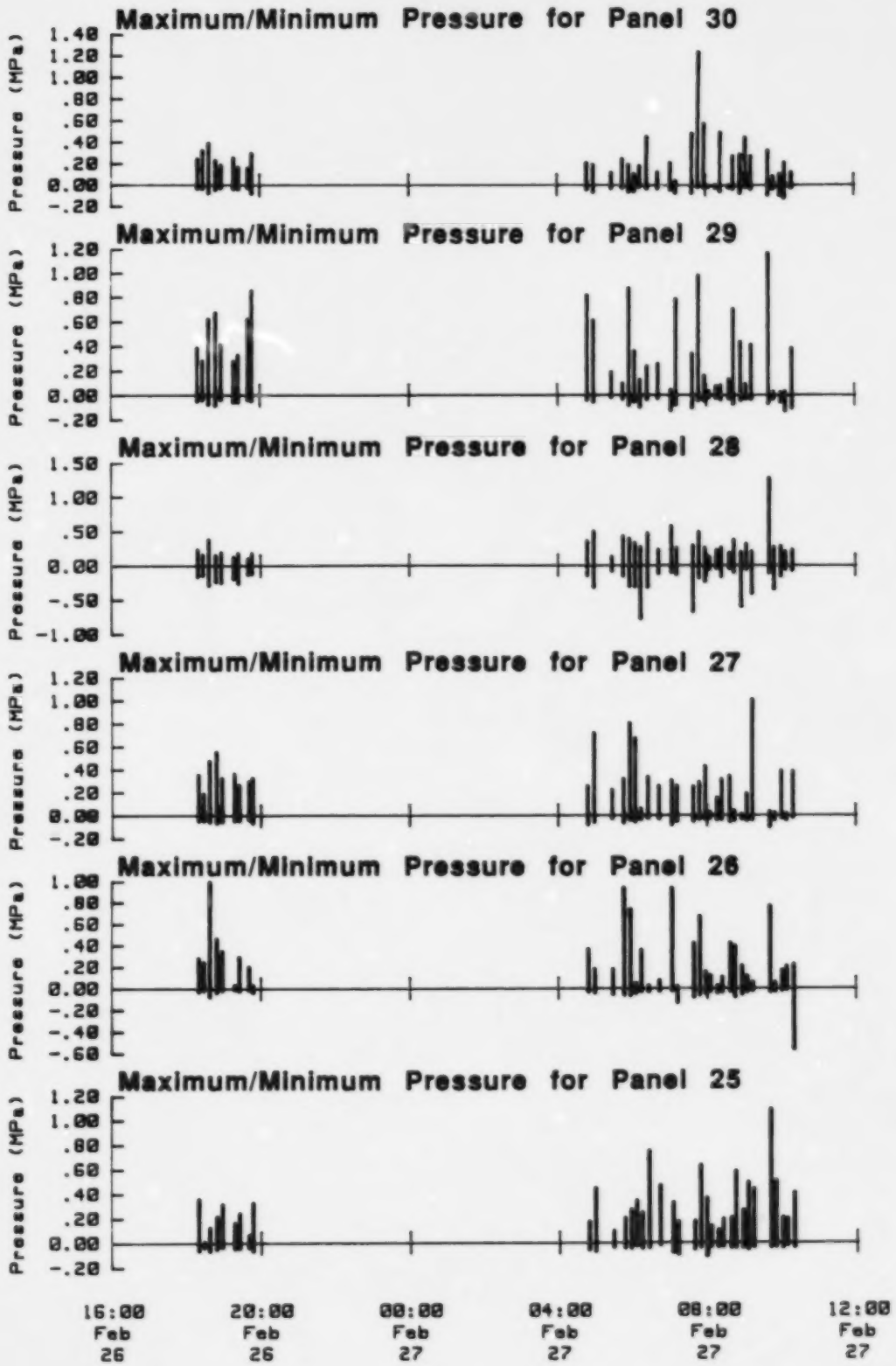
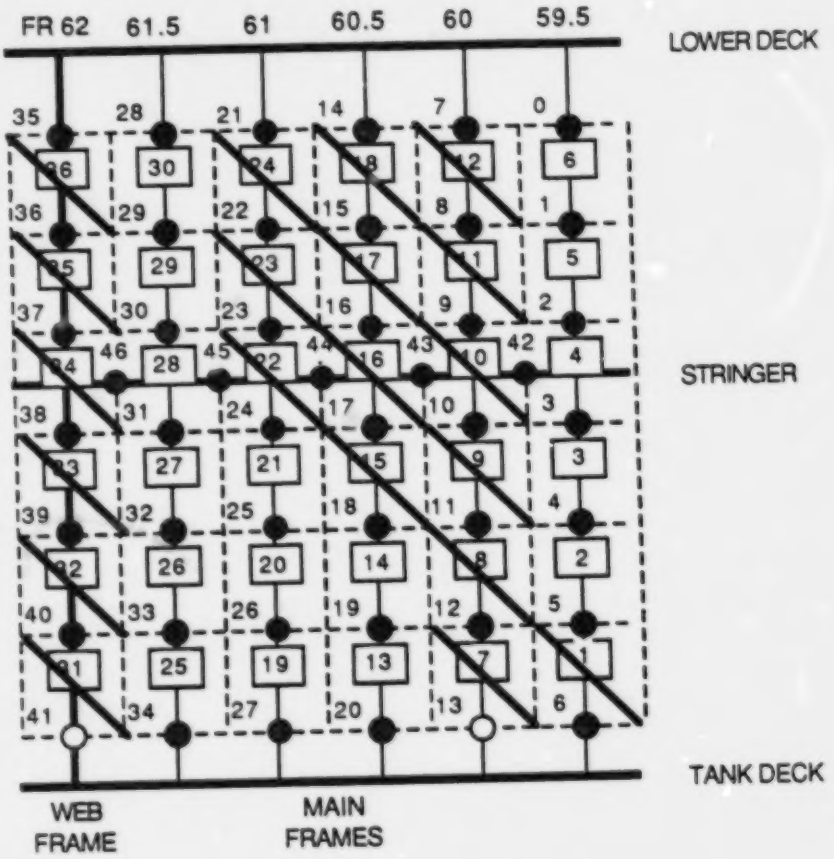


Figure 6.2

Summary of Qualitative Assessment of Ice Panel



A qualitative assessment of the entire set of data is summarized in Figure 6.2. In general, the frames which were calibrated produced reasonable results. The main frames, the stringer and the web frame which were not calibrated produced questionable results. However, even though frame 60.5 was calibrated, the upper half produced some strange results towards the end of the test period. Drifting was noted on the gauges that form those panels.

In total, sixteen of the panels produced good and reasonable results. These were numbers 1, 2, 3, 4, 5, 17, 18, 22, 23, 24, 25, 26, 27, 28, 29 and 30. Of the remaining twenty panels, two are unusable due to gauge failure. However, the remaining eighteen panels may still be used if a more accurate transfer function can be obtained, since the measured strain data appears to be valid.

6.3 Derived Ice Pressures and Frame Loads

As stated above, sixteen of the panels provided good data. A total of 98 eight-minute windows were collected (in which simultaneous readings were taken of all gauges at the time when any gauge peaked). Therefore, if each eight-minute peak pressure is considered as a data point, then there were 1,568 data points gathered.

Figure 6.3 shows a histogram of all the single panel data. The data was grouped as being above the stringer, on the stringer, below the stringer and all panels. Clearly the panels above the stringer (only four of the sixteen) saw the highest pressures.

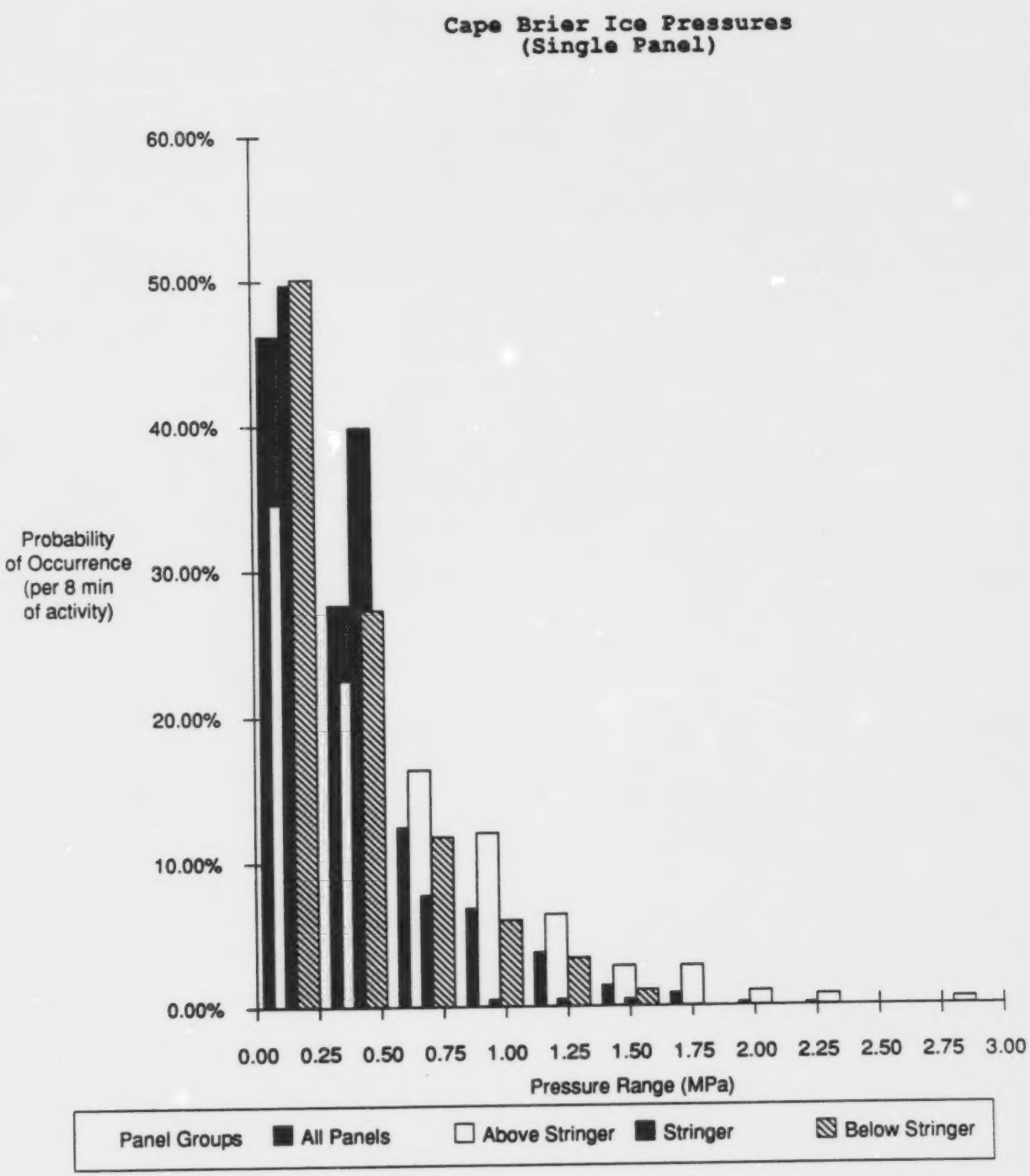
The same data can be plotted as a cumulative frequency distribution as shown in Figure 6.4. This plot represents ice loads during typical operations of the CAPE BRIER in ice. The panel pressures are plotted versus the probability of measuring a higher pressure (in an eight-minute window of ice activity). For example, the probability of exceeding a pressure of 1 MPa (145 psi) on a specific panel above the stringer is 0.1 (i.e. 10% chance) for every eight-minutes of ice activity.

The highest pressure recorded on a "good" panel was a single reading at 2.67 MPa. While that may have been a spurious reading the rest of the data set generally supports the possibility of data in the 2 MPa range.

Figure 6.5 illustrates the statistics of average pressures over four panels (2 x 2) and eight panels (3 x 3 less 1). These average pressures are well below the single panel pressures, being about 0.6 MPa and 0.4 MPa for four and eight panels respectively. (Note that the eight panel groups was made up of the same panels that constituted the four panel groups and all were below the stringer). The trend of lower average pressure with increasing area is obvious.

Figure 6.3

Histogram of Ice Pressures



The data from transverse framing determines the effective 'line' loads on the frames. Figure 6.6 illustrates the line loads on various frames and portions of frames. The 'line' load has the width of a pressure panel and so is expressed as a load per panel area (or pressure). To convert these line pressures to line loads in MN/m, multiply the pressures by .325 m. The length of the load is equal to the number of panels times .332 m/panel.

Again it is clear that pressure decreases as load increases, and that the highest loads are above the stringer.

It is also interesting to note that the upper portions of the curves on Figure 6.6 seem to be flattening out. (This was not as apparent in Figures 6.4 and 6.5). This could be suggesting that some upper limit is being reached. There is insufficient data to be certain of this effect.

6.4 Spatial Variation of Load

To examine the spatial variation of load, the data is plotted as average pressure versus length and area for a probability of .01 (i.e. 1% probability of seeing this load during an eight-minute window). Figure 6.7 plots the average pressure versus length along frame. The data shows the typical decreasing pressure with area trend. The plot is on log-log paper, as is common for this type of data. It would be premature to fit a curve to this data. However, it is possible to speculate on the shape of the actual ice imprint (as might be used for design).

Figure 6.8 shows the same data (pressure versus frame length) plotted on linear paper. Superimposed on this data is an average pressure versus area curve that would result from a triangular ice pressure distribution, with a 3 MPa pressure at the apex and a base length of .7 m. The peak pressure and base length were chosen to best match the measurement data. No definitive conclusion can be reached from this comparison. They are presented as a future approach to specificiation of a design load. Triangular pressure distributions have been proposed [16] to handle the design of transverse framing. Direct comparisons of measured data with proposed criteria are premature due to the small size of the collected data. It is at least encouraging that the data does exhibit reasonable trends in this regard.

Figure 6.9 plots the data as a function of area, to include lateral effects. At 1 m^2 the envelop on the data would be at 400 kPa (58 psi).

Figure 6.4

Cumulative Distribution of Ice Pressures
for a Single Panel

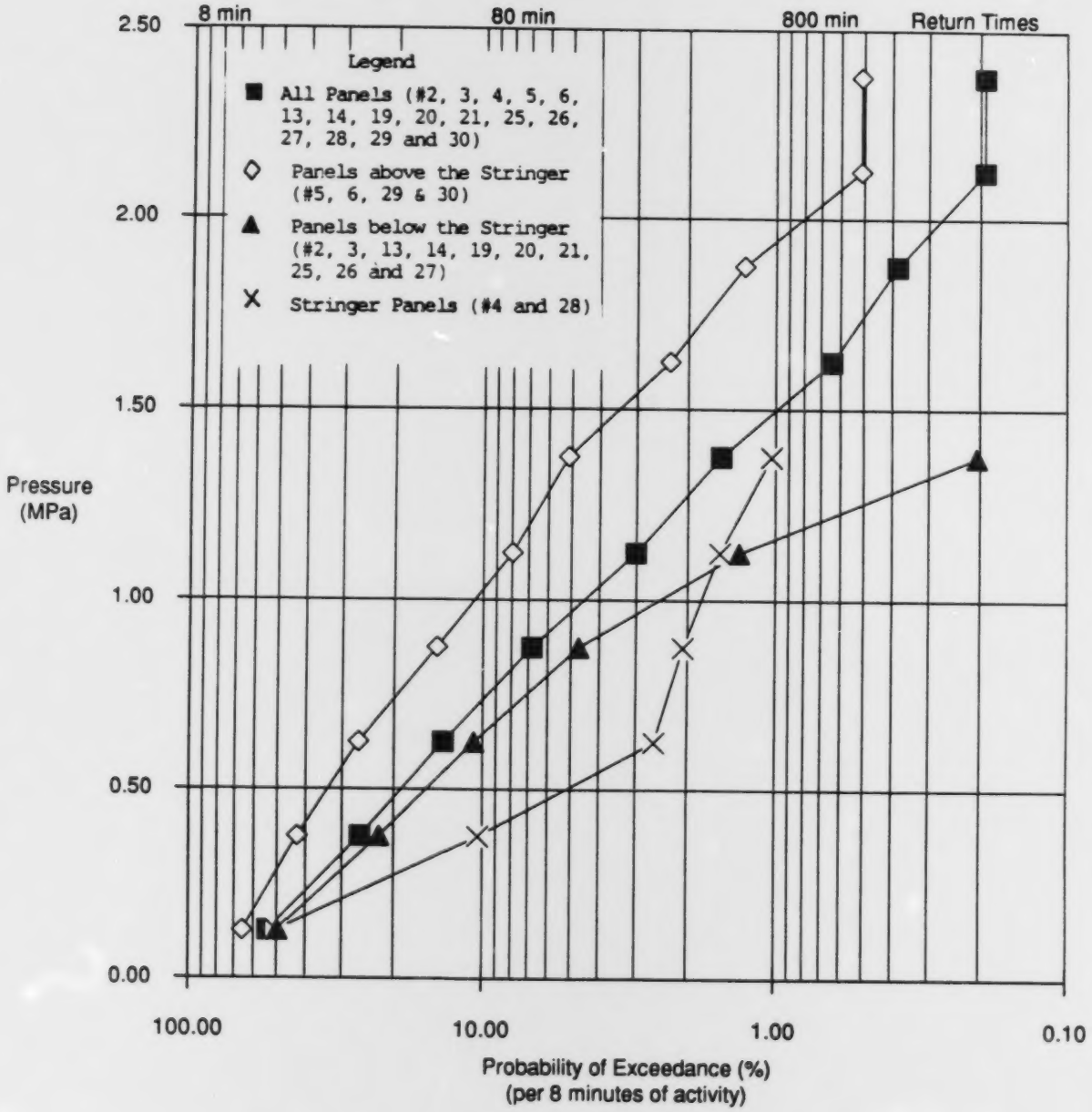


Figure 6.5

Cumulative Distribution of Ice Pressures
for Multiple Panels

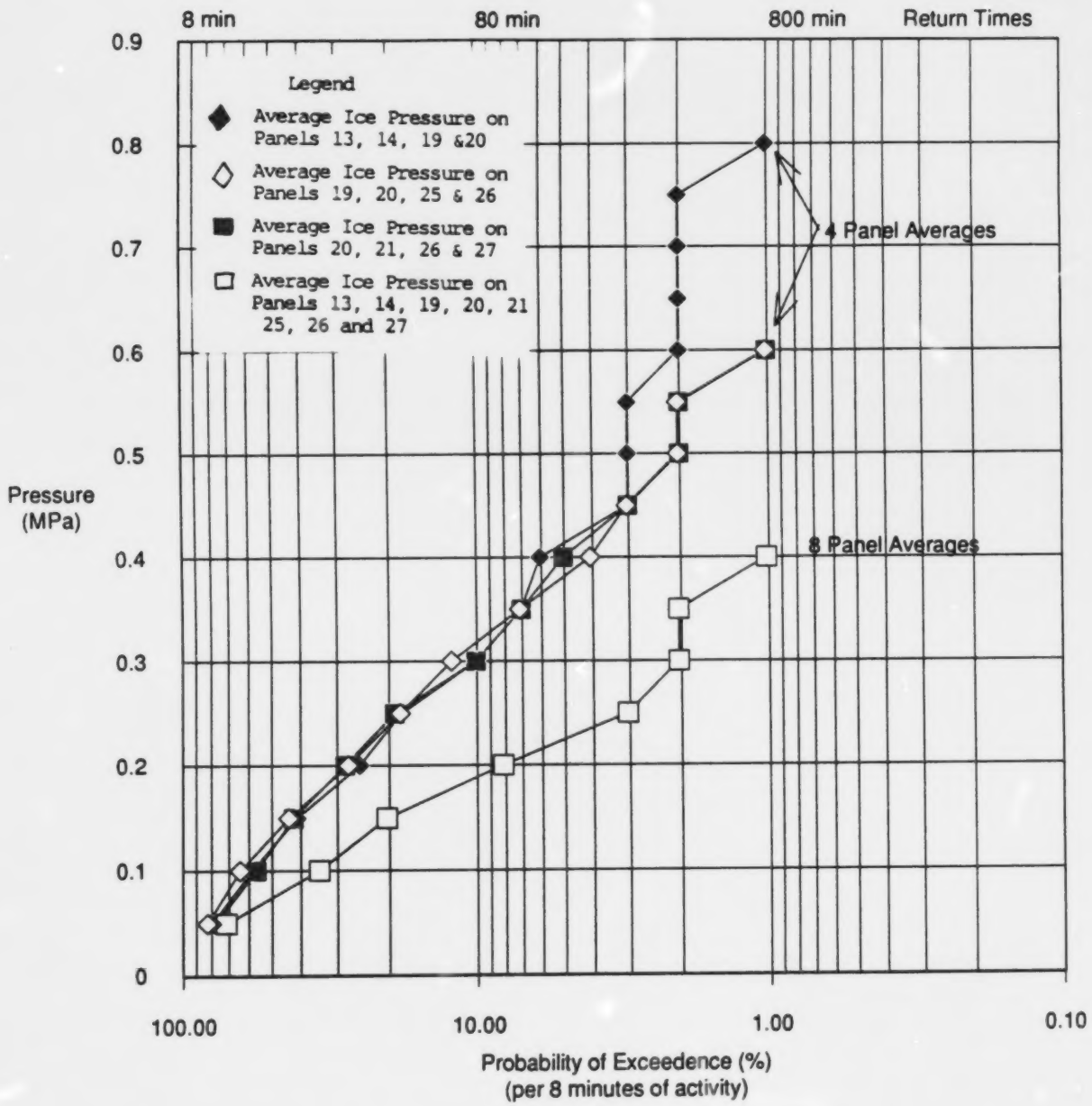


Figure 6.6

Cumulative Distribution of Ice Pressure
Line Loads

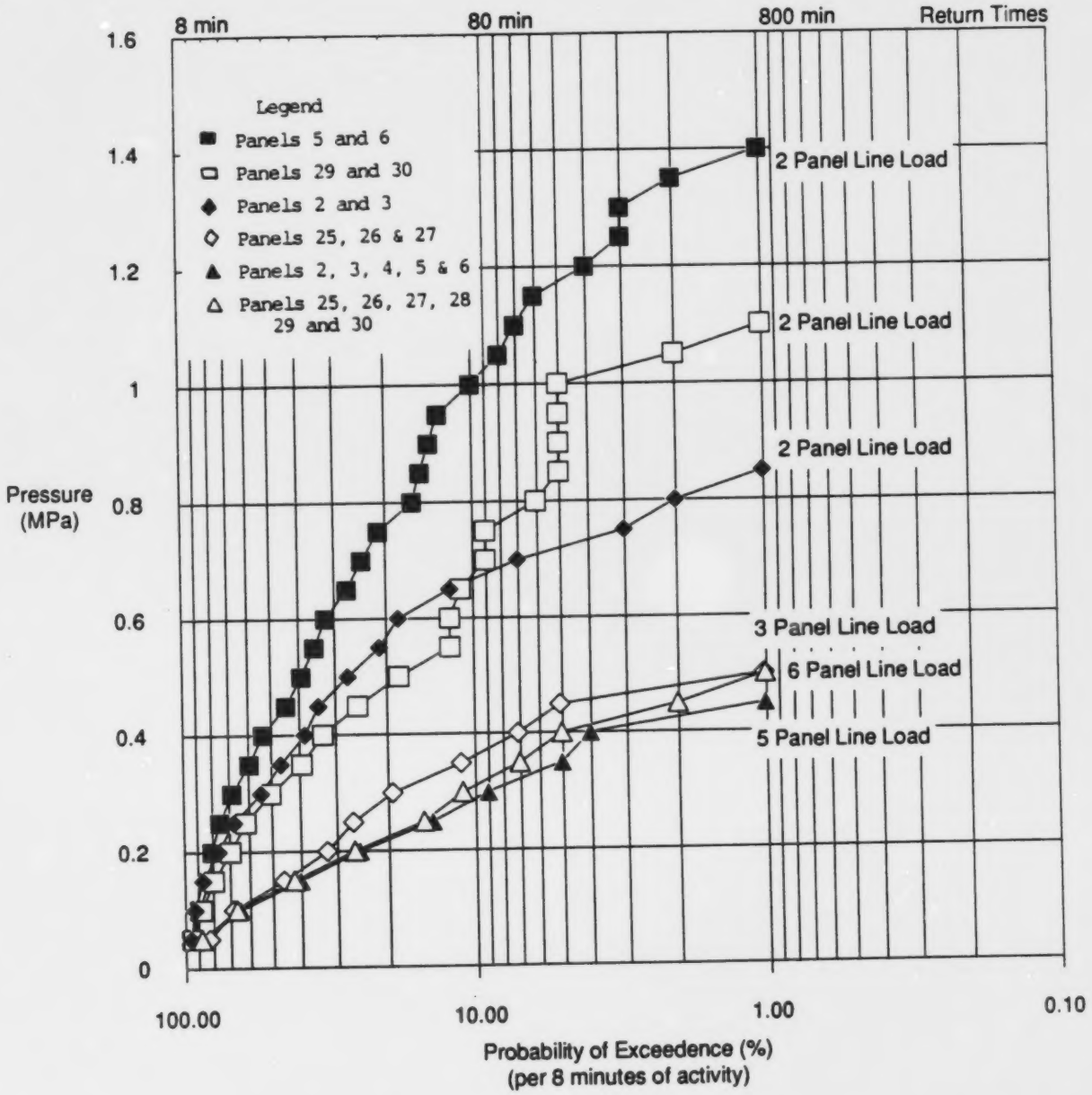


Figure 6.7

Log Log Plot of Average Ice Pressure
Versus
Length Along The Frame

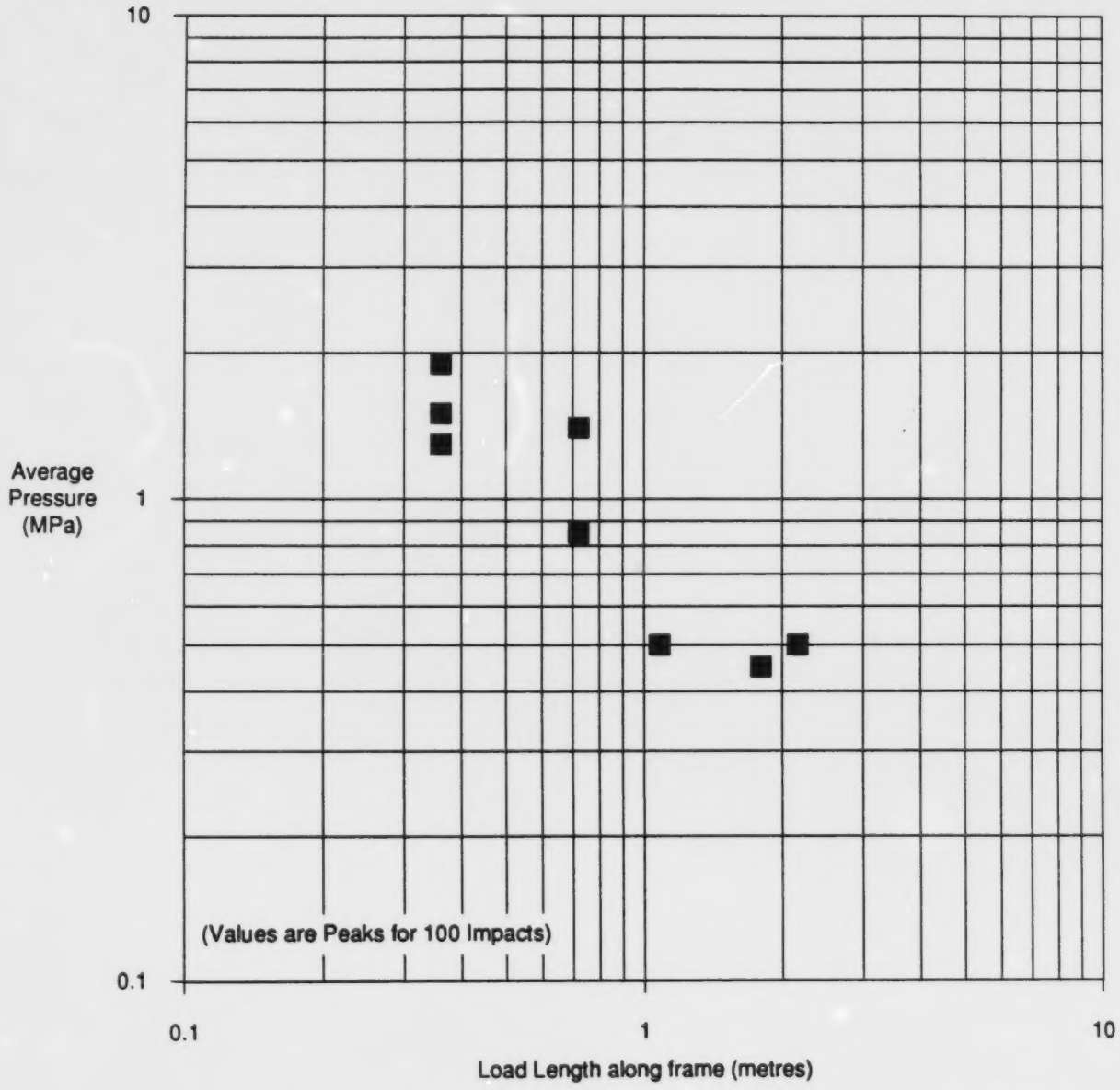


Figure 6.8

Linear Plot of Average Ice Pressure
Versus
Length Along the Frame

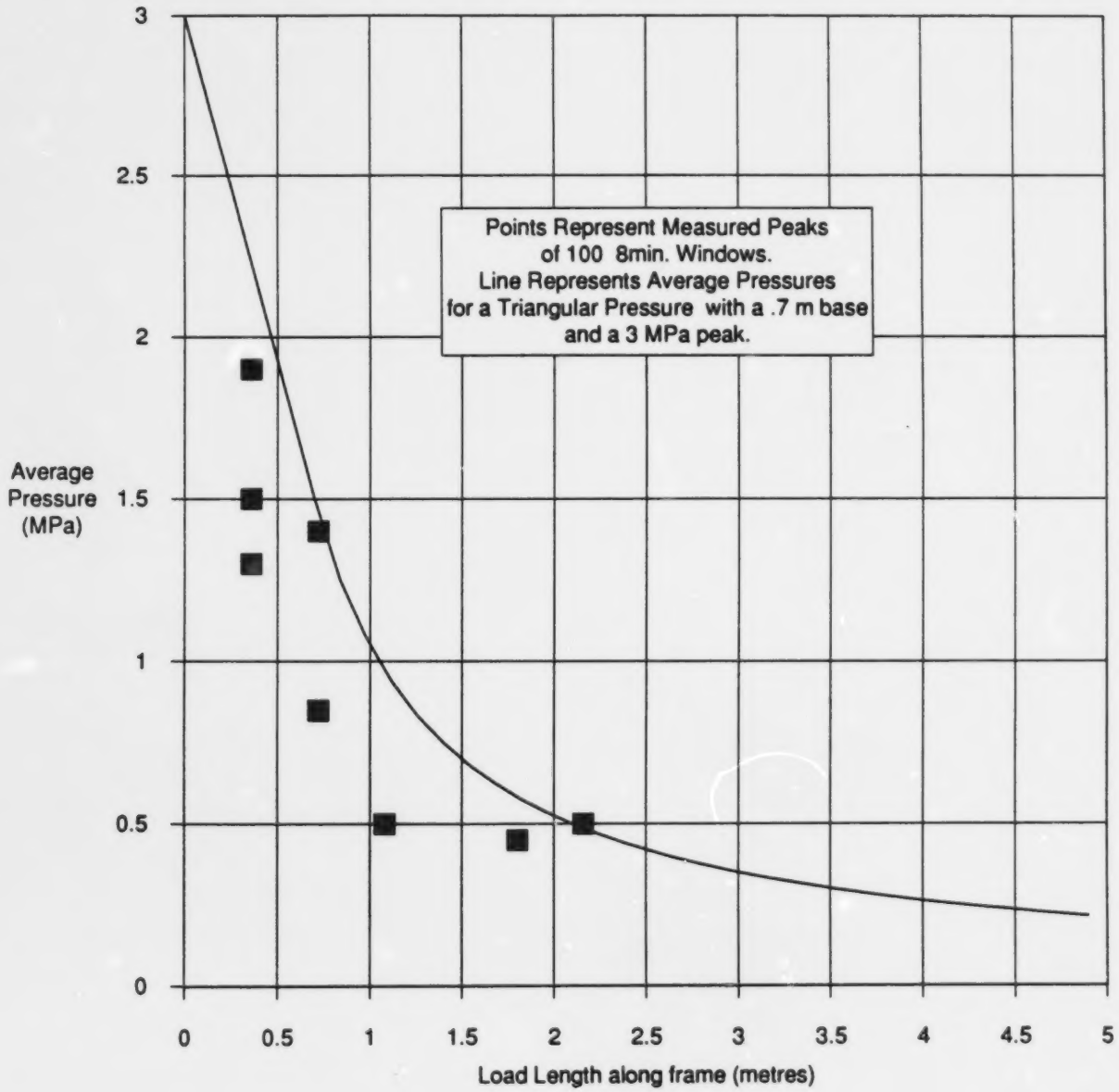
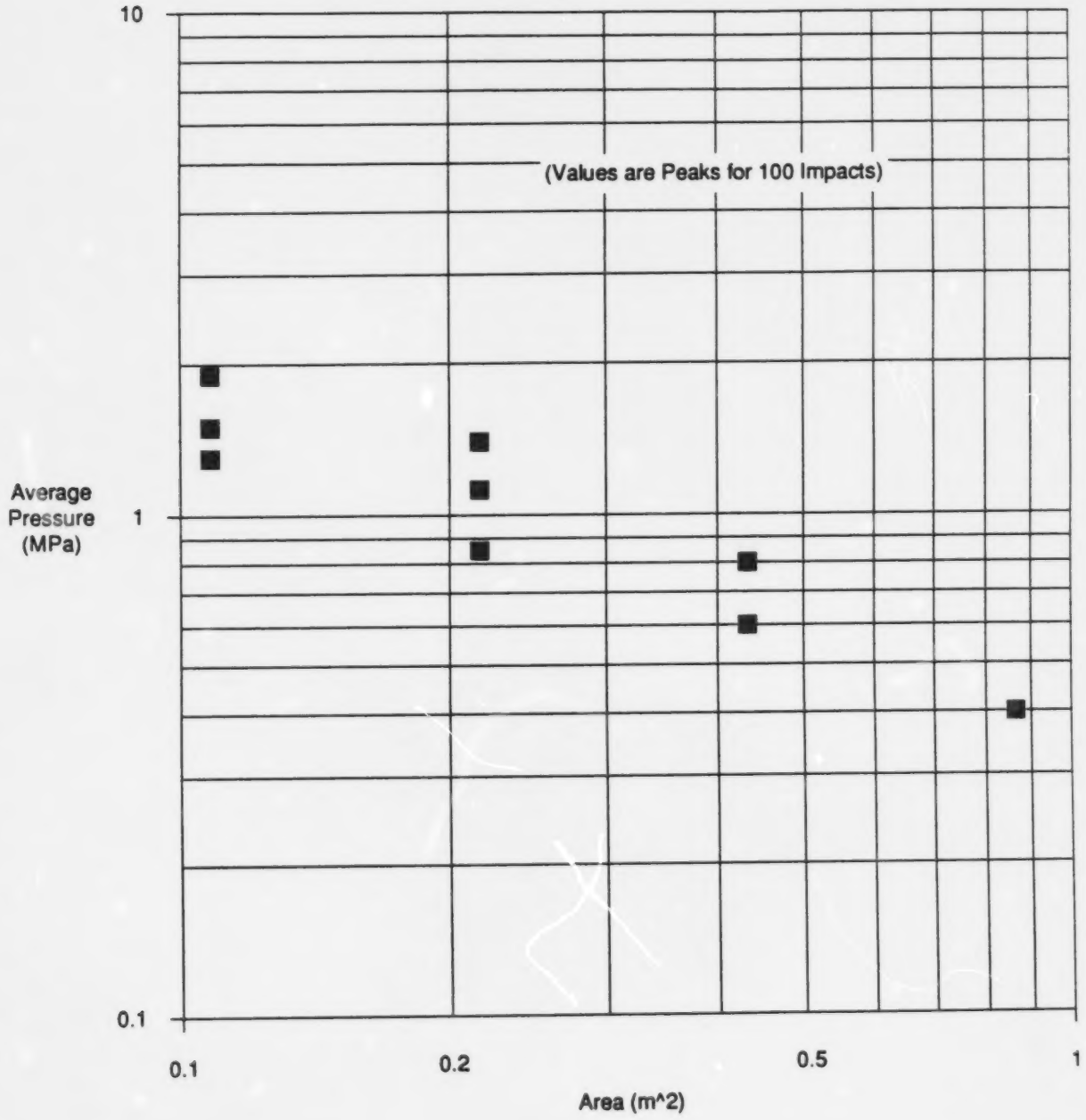


FIGURE 6.9

Average Pressure vs Area



6.5 Comparison of Measured Pressures to Design Pressures

As stated earlier, the CAPE BRIER is ice strengthened to a Lloyds Register Class 1A Super. The shell thickness design formula from the 1978 Lloyds Register Rules (which were in use when the ship was designed) is:

$$t = 0.667\ S \sqrt{P/\sigma_y} + 2 \qquad (6.1)$$

where S = frame spacing = 325 mm

σ_y = yield strength = 235 MPa

P = design ice pressure = 1.62 MPa

Equation 6.1 results in a plate thickness of 20 mm, precisely the plate thickness of the CAPE BRIER. This formula, although used by Lloyds, is a standard formula from Timoshenko [17] and results in initial yielding at the design pressure. Equation 6.1 assumes the boundary condition of the plate is 'fixed-fixed'; with an aspect ratio equal to that of a panel on the CAPE BRIER, the plating of the CAPE BRIER will yield at or just above an ice pressure of 1.62 MPa.

In the 1985 version of the Lloyds rules, the design formula was changed to:

$$t = 0.400\ S \sqrt{P/\sigma_y} + 2 \qquad (6.2)$$

where P = design ice pressure = 4.70 MPa

This formula also results in a plate thickness of precisely 20 mm. In fact, the two formulae will always result in the same values. The reason for the change is because Lloyds Registry recognized the importance of the plastic capacity of the shell plating. Lloyds also recognized that ice loads higher than 1.62 MPa occur.

Equation 6.2 is very close to the "three plastic hinge" formula suggested by Ratzlaff and Kennedy [18]. Thus, the new regulations suggest that the formation of two plastic hinges, one along each frame, is acceptable. The limiting ice pressure is when the third hinge forms. Therefore, according to Lloyds, the shell plating on the CAPE BRIER is capable of at least 4.7 MPa. The appearance of the hull, if pressures approaching this magnitude occurred, would be a slight dishing of the shell plating.

Since ice pressures exceeded 1.62 MPa (the pressure where yielding begins, it is possible that dishing occurred. However, the hull plating is capable of withstanding loads well above this level.

A simplified formula for plate strength which includes its permanent deformation is given by Ratzlaff and Kennedy [18]:

$$P = \frac{8\ \sigma_y}{(1 - \nu_p^2)}\ (t/S)(w/S)\ \frac{1}{\sqrt{1 + 4\ w/S}} \qquad (6.3)$$

where w = permanent deformation

ν_p = Poison's ratio in the plastic range (0.5 for steel)

Figure 6.10 shows a plot of this equation. At the highest measured pressure of 2.67 MPa, a permanent set of 5.6 mm would occur. This would barely be visible. However, due to the statistical nature of the ice impacts, larger deflections will probably occur.

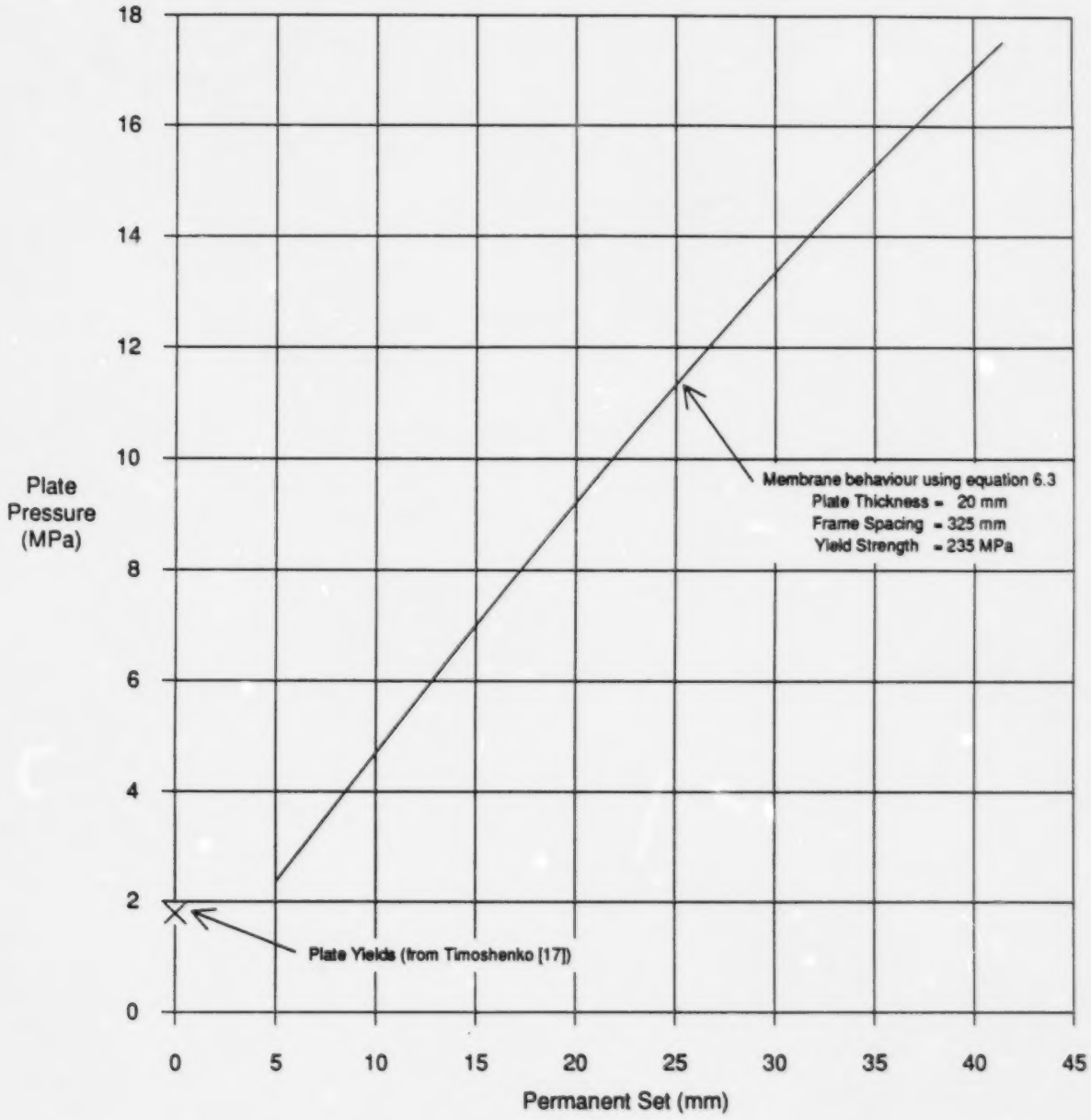
One should emphasize that in all likelihood, the CAPE BRIER did not strike any multi-year ice during these tests. However, the BRIER was in the vicinity of multi-year ice during the earlier program reported in [4]. If she does strike multi-year ice, then considerably higher pressures will occur.

The significance to design of striking multi-year ice is uncertain. The residual membrane strength of the plating is considerable (up to 14 MPa). However, the risk of multi-year ice lies in its effect on the framing. The framing does not have the same high reserve capacity as the shell plating.

The geometric complexity of the framing prevents a simple comparison with the design codes. Several steps are necessary to see the implications of this work on the ice strengthened frames. An adequate description of the load, including magnitude and shape is needed to assist in the frame design. The designer should apply the worst possible load to both the longitudinal and transverse frames. Once the frames are checked against bending, shearing and tripping failures, conclusions regarding the adequacy of the frames are drawn. This process is complex and must be thoroughly compared with current frame design practices.

Figure 6.10

Plating Strength
Pressure vs. Permanent Set



7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

This project has offered the opportunity to gather important data on ice loads on ships in light ice conditions. In particular, it has provided the first real evidence of fishing vessel structural response in ice. The following specific conclusions can be set down:

(a) The difficulty in getting good agreement between the finite element model and the physical calibration, coupled with the limited ship time in ice has resulted in a small data set (98 eight-minute windovs of ice activity over some 44% of the instrumented area).

(b) The ice impacts appear to be localized with a quite 'peaked' pressure distribution.

(c) The measured pressures are well belov any Arctic measurements [6], but of the same order as the nominal plating design pressure for this class of vessel (e.g. around 2 MPa compared with 1.62 MPa for 1A Super).

(d) The ice pressures above the stringer vere considerably higher than those below the stringer. This is thought to be due to the location of the waterlines during the voyage.

(e) The evidence from the measured data indicates that the pressure necessary to exceed the yield strength of the plate was experienced and that a small amount of plate distortion likely occurred in these ice conditions.

7.2 Recommendations

7.2.1 General

To improve the chances of success on future projects, it is recommended that:

- finite element work must be emphasized and given a high priority in the planning of the project. Experience suggests that this area tends to be underestimated.
- physical calibrations should be as extensive as possible.
- all possible effort must be made to get the ship into the target ice conditions. Alternatively, this type of project should be continued for several years of data collection.

- in selecting the trials vessel, the quality of fabrication and the form of structural configuration should be considered if possible, as they have a significant impact on the quality of the results.

- it is recommended that a review of load measuring techniques and the degree of their success be made in light of some 10 years of experience in order to provide guidelines for future programs.

- the approach of transforming the ship's structure into a transducer must be developed further. In particular, an understanding of where errors can arise and guidelines for minimizing these should be obtained.

- with the recognition of the plastic strength of the ship's structure, techniques that can measure plastic response should be developed. Accurate techniques of surveying the plastic deformation of plating and framing would be very useful. With knowledge of the plastic strength of the hull structure (from plasticity theory, or plastic F.E. methods - both of which are well developed), deformation measurements will make it possible to estimate peak ice loads quite accurately. If the same equipment can be used on a large number of vessels, then a large statistical data base can be produced. A study of alternative strain measurement techniques is therefore recommended.

7.2.2 Project Recommendations

Since the amount of time the CAPE BRIER spends in ice is limited, it is not recommended that tests continue on this vessel.

It would be worthwhile however, before removing instrumentation, to perform a more extensive physical calibration, if the vessel can be made available.

This should be done in conjunction with a more rigorous F.E. model that includes warping effects. By developing this more elaborate (and expensive) model, it is likely that additional data from some 18 'pressure panels' (those not on the physical calibration program) can be re-processed to improve the data quantity.

An initial investigation of the problems with the finite element model suggest that inability to model warping was the cause. Warping is generally a linear elastic type of behaviour. It is however a very complex three-dimensional problem that is not considered in the formulation of many finite elements. Further finite element work must ensure that warping behaviour is correctly treated.

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MEASUREMENT OF ICE FORCES ON SMALL VESSELS VOLUME II - APPENDICES

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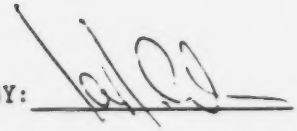
Un sommaire en français de ce rapport est inclus avant la Table des matières.

APPROVED BY: 

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17 Abstract

This report discusses the second phase in a project to investigate ice loads on the hulls of small vessels. An array of strain gauges had previously been fitted to the starboard bow of the National Sea Products vessel CAPE BRIER. The instrumentation system was designed to monitor the gauges continuously, and to activate the recording system when any of the gauges exceeded a threshold strain, indicating loading activity. During a two week voyage in late winter 1987, south and east of Newfoundland, 784 minutes of ice activity were recorded.

The results from these tests can assist in assessing the adequacy of, and setting standards for the design of frames, stringers, and hull plating for lightly ice-strengthened vessels.

In addition, the project has provided invaluable information on the techniques for measuring ice loads on ships.

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17 Résumé

Ce rapport traite de la phase II d'un programme d'étude de la charge exercée par les glaces sur la coque des bateaux de petite taille. À cette fin, le chalutier CAPE BRIER appartenant à la National Sea Products avait été équipé d'un réseau de jauges extensométriques, s'étendant sur la proue tribord. L'information transmise par les capteurs était recueillie par la chaîne de mesure qui l'enregistrait dès que la déformation dépassait un seuil de consigne, signifiant ainsi qu'une charge était exercée. Durant le voyage de deux semaines fait vers la fin de l'hiver 1987, au sud et à l'est des côtes de Terre-Neuve, les interactions bateau-glaces significatives ont duré au total 784 minutes.

Les résultats de la recherche visent à aider dans l'appréciation des normes actuelles ou futures sur la tenue aux glaces des bateaux dont la coque a été légèrement renforcée.

En outre, la recherche a permis d'enrichir les connaissances sur les techniques de mesurage des charges exercées par les glaces sur la coque des navires.

18 Mots-clés	19 Diffusion
Charges, forces, glaces, membrure, coque, bateau de pêche.	Le Centre de développement des transports dispose d'un nombre limité d'exemplaires.

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SUMMARY

This report discusses the second phase in a project to investigate ice loads on small vessels in light ice conditions. The fishing trawler 'CAPE BRIER' was fitted with an array of strain gauges to measure ice loads over 3.8 m^2 of the starboard bow. This phase of the project included the placement of twelve additional strain gauges, further finite element modelling and physical calibrations. Improved data collection hardware and software were designed and installed. Data was collected during operations off the Newfoundland coast and is presented and analyzed in this report.

The ice load panel in the CAPE BRIER is made up of seven pairs of shear strain gauges on each of five adjacent main frames. A web frame, which is adjacent to the instrumented main frames and forms the forward edge of the panel, is instrumented with seven pairs of shear strain gauges. A large stringer, which is approximately midway between decks and divides the panel horizontally, is fitted with five pairs of shear strain gauges. The gauges allow the determination of the shear distribution along each member. From this, the applied ice loads can be derived.

The data acquisition software scanned all channels continuously, in eight-minute scan periods. When ice loads caused activity above a pre-set threshold, the data was stored. The stored data consisted of three files for each eight-minute interval of activity:

- A 47 X 47 array of strains, each row of which contained simultaneous readings from all gauges, at a time corresponding to the peak of a particular gauge.
- A vector array containing the time at which each gauge peaked (i.e., time of each row).
- A vector array containing the average of all values for a given gauge over the entire interval.

One of the recommendations of the first phase of the work in 1984 was that a more detailed finite element model be constructed in order to obtain a more accurate estimate of loads from measured strain. This refined model was constructed; however the correlation between the physical calibration and the finite element model was not significantly improved over that in the first phase. Strain prediction errors of 50% and more were still found to exist. As a result, the ice loads derived from the new finite element model, lack credibility.

To obtain ice pressure data, an algorithm was developed directly from the physical calibration. This algorithm proved suitable for those frames that were calibrated (Frames 59 1/2, 60 1/2 and 61 1/2), but less suitable for those frames that were not calibrated (Frames 60, 61 and 62). More extensive physical calibration would permit pressure data to be extracted from the uncalibrated frames because the problem was primarily with the assumptions made in the conversion algorithm.

In total, 105 eight minute data sets were collected, 98 of which were above the ice load threshold, representing 13 hours of ice activity.

A log of the ship's navigation and ice information was kept during the voyage.

Statistical analysis of individual panel pressures was performed and is presented as histograms and cumulative probability plots. Higher ice load pressures were recorded above the horizontal stringer than below. It was also observed that the peak pressure was directly related to the number of measurements involved. This signifies that although the highest individual pressure measured was 2.67 MPa in 784 minutes of ice activity, a higher pressure would be likely if the measurement time was increased. The extreme value analysis indicates that a peak of 3.4 MPa may be expected for about 5-1/2 days of ice activity, (5-1/2 days equals 1000 eight-minute intervals).

Statistical analysis of frame and grillage loads (i.e., line and area loads) was performed and showed that the peak pressure decreased sharply as the length or area of the load increased, and that the peak frame loads were approaching an upper limit.

Measured pressures were of the same magnitude as the design pressures for the plating, and the evidence suggests that plastic deformation is most probable in these ice conditions. This deformation would, however, be small and barely discernible.

While the results were less than expected owing to the inability to achieve a satisfactory ice pressure calibration function for the whole panel and to the small amount of ice activity, the project has provided the first evidence of fishing vessel structure response in ice. It also revealed shortcomings in the measurement technique that warrant further study.

Recommendations are made both for the general problem of measuring ice loads on ships and for the future of the CAPE BRIER program.

SOMMAIRE

Ce rapport traite de la phase II d'un programme d'étude de la charge exercée par des glaces de faible épaisseur sur la coque de petits bateaux. À cette fin, le chalutier CAPE BRIER avait été équipé d'un réseau de jauges extensometriques s'étendant sur une zone de 3,8 m^2 de la proue tribord. Les travaux compris dans cette phase ont été les suivants: mise en place de 12 jauges supplémentaires, affinement de la modélisation par la méthode des éléments finis, étalonnage des éléments de mesure ainsi que conception et installation d'une chaîne de mesure améliorée. La saisie des données a été faite au large de Terre-Neuve; leur analyse est présentée dans le rapport.

Le panneau instrumenté comporte sept paires de jauges sur chacune de cinq membrures contiguës instrumentées, jauges servant à mesurer les déformations dues au cisaillement. Une porque contiguë, correspondant à l'extrémité avant du panneau instrumenté, a été équipée à son tour de sept paires de jauges, tandis que la serre qui se trouve environ à mi-chemin entre les deux ponts et divise le panneau instrumenté en deux dans le sens horizontal a été équipée de cinq paires. Ces jauges permettent de déterminer la distribution des forces de cisaillement de long des membrures. À partir de là, les forces exercées par les glaces peuvent être calculées.

L'information transmise par les capteurs était recueillie par blocs de 8 minutes, l'enregistrement des forces se faisant dès que la déformation dépassait un seuil de consigne. Les données ainsi enregistrées étaient stockées dans trois fichiers, à savoir:

- un fichier bidimensionnel disposé en colonnes et en rangées, pour l'enregistrement simultané des signaux des 47 jauges lorsque la déformation captée par une jauge quelconque atteint une valeur maximale.
- un fichier où est stocké l'heure précise correspondant à chaque valeur maximale de charge enregistrée dans chacune des colonnes.
- un fichier où est stocké la moyenne des valeurs de charge enregistrées par chaque jauge durant la période de mesure.

Comme suite à une des recommandations faites à l'issue des travaux de la phase I en 1984, le modèle obtenu par la méthode des éléments finis a été affiné, de manière à pouvoir tirer des déformations mesurées des prévisions plus précises sur les charges exercees. Toutefois, la corrélation entre le résultat produit par l'étalonnage et celui tiré du modèle ne s'est pas améliorée par rapport à la phase I. Vu la persistance d'erreurs de 50 p.100 et plus dans les prévisions du modèle, il s'ensuit que les charges des glaces calculées à partir de ces données sont sujettes à caution.

La pression des glaces a été obtenue par conversion des résultats de l'étalonnage à l'aide d'un algorithme. Cette méthode a donné de bons résultats à l'égard des membrures qui avaient servi à l'étalonnage (membrures 59 1/2, 60 1/2 et 61 1/2), mais ils ont été moins bons vis-à-vis de celles dont les jauges n'avaient pas été étalonnées (membrures 60, 61 et 62). Un étalonnage plus poussé permettrait d'apprécier la valeur des pressions qui sollicitent les membrures non étalonnées, étant donne que les lacunes constatées sont attribuables avant tout aux hypothèses retenues pour l'élaboration de l'algorithme de conversion.

Au total, 105 blocs de 8 minutes d'information ont été obtenus, desquels 98 ont dépassé le seuil de consigne, soit 13 heures d'interactions bateau-glaces significatives.

Durant le voyage, les données concernant l'itinéraire et les conditions glacielles ont été consignées dans le carnet de bord.

L'analyse des valeurs de pression observées sur les éléments panneaux a permis d'établir des statistiques sous la forme d'histogrammes et de graphiques montrant les distributions de probabilité cumulative. Les valeurs de pression observées ont été plus élevées au-dessus de la ligne de démarcation représentée par la serre qu'au-dessous. Il a également été observé que la pression maximale est directement reliée au nombre de mesures prises en compte. En d'autres termes, si, durant les 784 minutes d'interactions bateau-glaces significatives, la pression maximale observée a été de 2,67 MPa, cela ne veut pas dire qu'une valeur supérieure à celle-ci n'aurait pas pu être observée au bout d'un temps d'observation prolongé. L'analyse des valeurs extrêmes observees permet d'estimer à 3,4 MPa la valeur extrême qui pourra être observée au bout de 5 1/2 journées d'opérations dans les glaces, soit 1000 blocs de 8 minutes.

L'analyse statistique des charges sollicitant les membrures et les éléments panneaux, c'est-à-dire les charges linéaires et surfaciques, démontre que les valeurs maximales de pression diminuent rapidement à mesure que les longueurs ou les surfaces prises en compte augmentent, et aussi que les charges maximales sur les membrures commençaient à s'approcher de la limite supérieure.

Il a été constaté que les pressions mesurées sont du même ordre que les pressions de référence prévues sur le bordé, ce qui porte à croire à la probabilité d'une déformation plastique due aux conditions glacielles observées, mais cette déformation serait de très faible amplitude, voire difficile à discerner.

Bien que les résultats de la recherche ne soient pas à la hauteur de ceux escomptés, à cause de l'inaptitude du modèle à figurer avec justesse les valeurs produites par l'étalonnage du panneau instrumenté et en raison de la faible durée des interactions bateau-glaces

significatives, il reste qu'elle a été la première à mettre en évidence la tenue d'un bateau de pêche aux glaces. Quant aux faiblesses des techniques de mesurage mises en oeuvre, seule une recherche plus poussée permettra de les corriger.

Des recommandations sont formulées concernant le mesurage de la charge des glaces sur la coque des navires en général et en ce qui a trait à la poursuite du programme à bord du CAPE BRIER.

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NOMENCLATURE

C_o	Constant
E	Young's Modulus
I	Cross Sectional Moment of Inertia of Member
$\|K\|$	Ice Pressure Calibration Matrix
K_i	Ice Pressure Calibration Value for row i, column i
P	Design Ice Pressure
P_i	Pressure on Panel 'i'
$\{P\}$	Hull Pressure Vector
Q	First Moment of Area about Neutral Axis
S	Frame Spacing
t	Thickness (flange and shell plate) (under gauge)
V	Shear Force
ΔV	Shear Force Difference
V_i	Shear Force for Gauge 'i'
ΔV_i	Shear Force Difference for Panel i
w	Maximum Permanent Set
ε	Strain
$\{\Delta\varepsilon\}$	Strain Difference Vector
σ_y	Yield Strength of Material
ν	Poison's Ratio in Elastic Range
ν_p	Poison's Ratio in Plastic Range
$\mu\varepsilon$	Micro strain

APPENDIX A

PHYSICAL CALIBRATION RESULTS

File: CAL1A
Date: Sept. 27/86
Location: 1U

All values are given as microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.09	-0.08	0.06	-0.05	-0.11	-7.04
0.54	-0.09	0.14	-0.22	-0.72	3.70
0.07	-0.05	0.12	-0.19	-0.19	3.34
Stringer 1.01	0.31	0.28	0.44	0.39	
0.00	0.01	0.14	0.14	0.10	-0.19
-0.09	0.00	0.11	0.14	0.14	-0.27
-0.09	-0.15	-0.14	0.13	0.14	-0.29
-0.22	0.09	0.17	0.08	0.14	-0.24

File: CAL1U
Date: FEB. 23/87
Location: 1U

All values are given as Microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.01	-0.08	0.07	-0.08	-0.15	-8.19
0.28	-0.06	0.19	-0.26	-0.88	4.43
0.16	-0.11	0.11	-0.26	-0.18	3.92
Stringer 0.63	0.22	0.37	0.61	0.50	
0.00	0.03	0.15	0.16	0.19	-0.23
-0.17	0.08	0.12	0.18	0.19	-0.27
-0.12	-0.07	-0.15	0.19	0.15	-0.26
-0.14	0.11	0.15	0.18	0.15	-0.27

Percent Difference

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
1.1%	0.0%	-0.1%	0.4%	0.6%	16.3%
3.7%	-0.4%	-0.7%	0.6%	2.3%	-10.4%
-1.3%	0.9%	0.1%	1.0%	-0.1%	-8.2%
Stringer 5.4%	1.3%	-1.3%	-2.4%	-1.6%	
0.0%	-0.3%	-0.1%	-0.3%	-1.3%	0.6%
1.1%	-1.1%	-0.1%	-0.6%	-0.7%	0.0%
0.4%	-1.1%	0.1%	-0.9%	-0.1%	-0.4%
-1.1%	-0.3%	0.3%	-1.4%	-0.1%	0.4%

File: CAL1E
Date: Sept. 27/86
Location: 1L

All values given as microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.74	-0.15	0.19	-0.15	0.24	1.18
0.36	-0.15	0.33	-0.44	-0.90	1.10
-0.09	-0.17	0.15	-0.47	0.14	0.83
Stringer 1.29	0.28	0.47	1.42	2.33	
-0.11	0.15	0.17	0.38	-0.52	-7.98
-0.11	0.04	0.13	0.23	0.00	-8.46
-0.20	-0.20	-0.23	0.05	0.61	7.39
2.33	0.10	0.14	0.04	0.85	6.57

File: CAL1L
Date: Feb. 23/87
Location: 1L

All values are given as microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.03	-0.15	0.18	-0.21	0.28	1.45
0.41	-0.13	0.38	-0.57	-1.04	1.31
0.45	-0.20	0.22	-0.55	0.11	0.99
Stringer 0.86	0.57	0.64	1.46	2.50	
-0.33	0.14	0.21	0.45	-0.56	-9.44
-0.32	0.07	0.14	0.32	0.03	-10.02
-0.13	-0.09	-0.21	0.15	0.71	8.72
-0.10	0.19	0.21	0.12	1.00	7.73

Percent Difference

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
8.4%	0.0%	0.1%	0.7%	-0.5%	-3.2%
-0.6%	-0.2%	-0.6%	1.5%	1.7%	-2.5%
-6.4%	0.4%	-0.8%	0.9%	0.4%	-1.9%
Stringer 5.1%	-3.4%	-2.0%	-0.5%	-2.0%	
2.6%	0.1%	-0.5%	-0.8%	0.5%	17.3%
2.5%	-0.4%	-0.1%	-1.1%	-0.4%	18.4%
-0.8%	-1.3%	-0.2%	-1.2%	-1.2%	-15.7%
28.7%	-1.1%	-0.8%	-0.9%	-1.8%	-13.7%

File: CAL3B
Date: Sept. 27/86
Location: 3U

All values are given as microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.28	-0.25	0.71	-3.13	-0.17	-0.09
0.70	-0.29	0.19	-6.39	-0.98	-0.41
0.68	-0.43	-0.28	9.34	0.05	-0.53
Stringer 1.94	1.71	1.53	-1.16	-1.20	
-0.32	0.23	0.52	-0.16	0.38	0.29
-0.43	0.18	0.38	-0.06	0.47	0.21
-0.43	-0.49	-0.37	-0.01	0.42	0.24
0.09	0.46	0.37	-0.05	0.37	0.29

File: CAL3U
Date: FEB. 23/87
Location: 3U

All values are given as Microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.18	-0.27	0.85	-3.67	-0.19	-0.11
0.94	-0.24	0.15	-6.98	-1.14	-0.50
0.94	-0.45	-0.36	10.75	0.05	-0.62
Stringer 1.41	1.49	1.74	-1.35	-1.78	
-0.49	0.30	0.58	-0.04	0.47	0.34
-0.48	0.34	0.44	-0.01	0.51	0.32
-0.44	-0.30	-0.47	0.01	0.48	0.32
-0.20	0.30	0.45	-0.04	0.45	0.33

Percent Difference

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
1.1%	0.2%	-1.5%	5.8%	0.2%	0.2%
-2.6%	-0.5%	0.4%	6.3%	1.7%	1.0%
-2.8%	0.2%	0.9%	-15.1%	0.0%	1.0%
Stringer 5.7%	2.4%	-2.2%	2.0%	6.2%	
1.8%	-0.7%	-0.6%	-1.3%	-1.0%	-0.5%
0.5%	-1.7%	-0.6%	-0.5%	-0.4%	-1.2%
0.1%	-2.0%	1.1%	-0.2%	-0.6%	-0.9%
3.1%	1.7%	-0.9%	-0.1%	-0.9%	-0.4%

File: CAL3E
Date: Sept. 27/86
Location: 3L

All values are given as microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.27	-0.19	0.04	0.99	0.33	-0.14
0.74	-0.29	0.44	0.90	-0.75	-0.41
0.65	-0.39	0.38	1.11	0.08	-0.48
Stringer 1.89	1.98	2.68	-1.00	-1.21	
-0.24	0.38	-0.14	-6.68	-0.66	0.41
-0.17	0.13	-0.24	-8.52	-0.38	0.31
-0.31	-0.13	-0.42	8.86	0.42	0.11
-0.20	0.04	0.71	7.23	1.17	0.00

File: CAL3L
Date: FEB. 23/87
Location: 3L

All values are given as Microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.40	-0.29	0.09	1.15	0.33	-0.13
0.39	-0.26	0.53	1.05	-0.82	-0.46
1.08	-0.46	0.46	1.28	0.10	-0.47
Stringer 1.06	1.72	3.23	-1.04	-1.80	
-0.42	0.37	-0.17	-7.59	-0.71	0.48
-0.47	0.27	-0.33	-9.84	-0.46	0.39
-0.33	-0.10	-0.50	10.33	0.48	0.19
-0.38	0.06	0.85	8.39	1.39	-0.02

Percent Difference

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-1.5%	1.1%	-0.6%	-1.8%	0.0%	-0.1%
-2.8%	-0.3%	-1.0%	-1.7%	0.8%	0.6%
-4.9%	0.8%	-0.9%	-1.9%	-0.2%	-0.1%
Stringer 9.4%	2.9%	-6.2%	0.5%	6.7%	
2.0%	0.1%	0.3%	10.3%	0.6%	-0.8%
3.4%	-1.6%	1.0%	14.9%	0.9%	-0.9%
0.2%	-0.3%	0.9%	-16.6%	-0.7%	-0.9%
2.0%	-0.2%	-1.6%	-13.1%	-2.5%	0.2%

File: CAL5A
Date: Sept. 27/86
Location: 5U

All values are given as microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.28	-3.88	0.63	-0.19	0.01	-0.05
1.59	-2.19	0.41	-0.31	-0.53	-0.24
1.84	10.51	-0.15	-0.43	0.04	-0.25
Stringer 3.04	-0.25	-1.29	-0.91	-0.99	
-1.02	-0.14	0.47	0.23	0.22	0.15
-1.13	-0.24	0.39	0.34	0.25	0.19
-0.66	0.06	-0.39	0.33	0.25	0.03
-1.12	-0.16	0.33	0.27	0.24	0.10

File: CAL5U
Date: FEB. 23/87
Location: 5U

All values are given as Microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.45	-4.28	0.71	-0.22	-0.01	-0.03
1.55	-2.54	0.46	-0.38	-0.47	-0.18
1.64	11.47	-0.14	-0.56	0.05	-0.23
Stringer 3.08	-0.33	-1.23	-1.06	-0.56	
-0.73	-0.14	0.55	0.29	0.22	0.16
-0.97	-0.23	0.41	0.33	0.26	0.14
-0.85	0.15	-0.42	0.36	0.24	0.11
-0.98	-0.20	0.36	0.36	0.24	0.15

Percent Difference

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-1.6%	3.8%	-0.8%	0.3%	0.2%	-0.2%
0.4%	3.3%	-0.5%	0.7%	-0.6%	-0.6%
1.9%	-9.1%	-0.1%	1.2%	-0.1%	-0.2%
Stringer -0.4%	0.8%	-0.6%	1.4%	-4.1%	
-2.8%	0.0%	-0.8%	-0.6%	0.0%	-0.1%
-1.5%	-0.1%	-0.2%	0.1%	-0.1%	0.5%
1.8%	-0.9%	0.3%	-0.3%	0.1%	-0.8%
-1.3%	0.4%	-0.3%	-0.9%	0.0%	0.5%

File: CAL5E
Date: Sept. 27/86
Location: 5L

All values are given as microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.00	0.99	0.00	-0.16	0.09	0.00
1.48	0.60	0.33	-0.46	-0.52	-0.19
1.82	1.50	0.34	-0.47	0.04	-0.19
Stringer 3.83	-0.52	-1.36	-0.64	-0.80	
-0.45	-7.36	-0.47	0.34	0.09	0.13
-0.41	-8.83	-0.57	0.37	0.19	0.10
-0.49	-7.91	-0.51	0.16	0.18	0.00
-1.15	6.54	1.30	-0.04	0.19	0.09

File: CAL5L
Date: FEB. 23/87
Location: 5L

All values are given as Microstrain/Ton

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
0.25	1.13	0.00	-0.22	0.05	-0.05
1.28	0.66	0.35	-0.53	-0.57	-0.21
1.88	1.68	0.46	-0.56	0.05	-0.25
Stringer 3.98	-0.59	-1.35	-0.79	-0.48	
-0.47	-8.35	-0.58	0.43	0.18	0.13
-0.45	-10.21	-0.60	0.45	0.20	0.12
-0.82	-9.55	-0.58	0.22	0.19	0.08
-1.03	7.55	1.52	-0.02	0.22	0.11

Percent Difference

Frame 62.0 Web Frame (fwd)	Frame 61.5	Frame 61.0	Frame 60.5	Frame 60.0	Frame 59.5 (aft)
-2.8%	-1.6%	0.0%	0.7%	0.5%	0.6%
2.3%	-0.7%	-0.2%	0.8%	0.6%	0.2%
-0.7%	-2.0%	-1.4%	1.0%	-0.1%	0.7%
Stringer -1.7%	0.8%	-0.1%	1.7%	-3.6%	
0.2%	11.2%	1.2%	-1.0%	-1.0%	0.0%
0.5%	15.6%	0.3%	-0.9%	-0.1%	-0.2%
3.7%	18.6%	0.8%	-0.7%	-0.1%	-0.9%
-1.4%	-11.4%	-2.5%	-0.2%	-0.3%	-0.2%

APPENDIX B

'L' AND 'K' MATRICES

From file:TRANSFER0

'L' matrix with ALL GAUGES WORKING

No	1	2	3	4	5	6	7	8	9	10	11	12	13
1	32.40000	-4.32000	0.00000	0.00000	-0.00000	-0.00000	-1.08000	-1.08000	-0.00000	0.00000	0.00000	0.00000	-1.08000
2	-1.08000	32.40000	-0.00000	0.00000	0.00000	0.00000	-1.08000	5.40000	0.00000	-0.00000	0.00000	-0.00000	-0.00000
3	-10.80000	-10.80000	16.20000	-23.22000	-23.22000	-23.22000	-.54000	-.54000	2.16000	-3.24000	-3.24000	-3.24000	2.16000
4	-0.00000	-0.00000	-0.00000	42.12000	-1.08000	-.54000	0.00000	0.00000	-0.00000	2.16000	.54000	1.62000	-0.00000
5	-0.00000	0.00000	0.00000	-1.08000	42.12000	-2.16000	0.00000	0.00000	-0.00000	1.62000	2.16000	1.62000	0.00000
6	-0.00000	-0.00000	0.00000	-1.08000	-2.16000	42.12000	-0.00000	-0.00000	0.00000	1.62000	2.16000	2.16000	0.00000
7	-2.16000	-2.16000	0.00000	-3.24000	-3.24000	-3.24000	37.80000	-7.56000	0.00000	-0.00000	-0.00000	-0.00000	-3.24000
8	1.62000	1.62000	0.00000	2.16000	2.16000	2.16000	-1.08000	32.40000	-0.00000	0.00000	0.00000	-0.00000	2.16000
9	0.00000	0.00000	-2.70000	5.40000	5.40000	5.40000	-48.60000	-48.60000	48.60000	-48.60000	-48.60000	-48.60000	-2.16000
10	0.00000	-0.00000	-0.00000	1.62000	1.08000	.54000	-0.00000	-0.00000	-0.00000	43.20000	-4.32000	-2.16000	-0.00000
11	0.00000	-0.00000	-0.00000	1.08000	1.62000	1.62000	0.00000	0.00000	-0.00000	-4.32000	44.28000	-4.32000	-0.00000
12	-0.00000	-0.00000	-0.00000	-0.00000	.54000	2.16000	-0.00000	-0.00000	0.00000	-2.16000	-4.32000	44.28000	-0.00000
13	-0.00000	-0.00000	-0.00000	0.00000	-1.08000	-1.08000	-1.08000	-1.08000	-0.00000	0.00000	0.00000	0.00000	42.12000
14	0.00000	-0.00000	0.00000	-0.00000	0.00000	-0.00000	-1.08000	-1.08000	-0.00000	0.00000	0.00000	0.00000	-7.56000
15	3.24000	3.24000	-2.16000	7.56000	7.56000	7.56000	4.32000	4.32000	-6.48000	8.64000	8.64000	8.64000	-48.06000
16	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	2.16000	.54000	1.62000	-0.00000
17	-0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	1.62000	2.16000	1.62000	0.00000
18	0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	1.62000	2.16000	2.16000	0.00000
19	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-1.62000
20	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-1.08000
21	1.08000	1.08000	-.54000	-0.00000	0.00000	0.00000	2.16000	2.16000	-4.32000	6.48000	6.48000	6.48000	3.78000
22	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000
23	-0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	-0.00000	0.00000	-0.00000
25	0.00000	0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000
26	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000
27	-2.70000	-2.70000	1.62000	-1.08000	-1.08000	-1.08000	1.62000	1.62000	-2.70000	4.32000	4.32000	4.32000	2.16000
28	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000
29	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000
30	-0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000
31	2.16000	2.16000	-2.16000	2.16000	2.16000	2.16000	2.70000	2.70000	-2.70000	1.08000	1.08000	1.08000	4.86000
32	-1.08000	-1.08000	.54000	-0.00000	-0.00000	-0.00000	-1.08000	-1.08000	1.08000	-.54000	-.54000	-.54000	-1.62000
33	-1.08000	-1.08000	2.70000	-4.32000	-4.32000	-4.32000	-4.32000	-4.32000	4.32000	-4.32000	-4.32000	-4.32000	-8.10000
34	-1.08000	-1.08000	.54000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000
35	0.00000	-0.00000	-.54000	1.08000	1.08000	1.08000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000
36	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	.54000	.54000	-.54000	0.00000	0.00000	0.00000	1.62000

From file:TRANSFERO

'L' matrix with ALL GAUGES WORKING

No	14	15	16	17	18	19	20	21	22	23	24	25	26
1	-1.08000	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-.54000	-.54000
2	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000
3	2.16000	-2.16000	2.16000	2.16000	2.16000	2.16000	2.16000	-2.16000	-2.16000	-2.16000	-2.16000	1.08000	1.08000
4	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000
5	0.00000	-0.00000	-.54000	-.54000	-.54000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000
6	0.00000	-0.00000	-.54000	-.54000	-.54000	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	-2.16000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-1.08000	-1.08000
8	2.70000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	1.08000	1.08000
9	-2.16000	4.32000	-7.02000	-7.02000	-7.02000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	3.78000	3.78000
10	-0.00000	-0.00000	.54000	.54000	.54000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000
11	-0.00000	0.00000	2.16000	2.16000	2.16000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000
12	-0.00000	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000
13	-7.56000	0.00000	0.00000	0.00000	-0.00000	-2.16000	-2.16000	0.00000	0.00000	0.00000	0.00000	-.54000	-.54000
14	12.12000	0.00000	.54000	.54000	.54000	-2.16000	-2.16000	0.00000	-0.00000	-0.00000	0.00000	-.54000	-.54000
15	-48.06000	48.06000	-48.06000	-48.06000	-48.06000	-2.16000	-2.16000	2.16000	2.16000	2.16000	2.16000	3.24000	3.24000
16	-0.00000	-0.00000	43.20000	-4.86000	-.54000	0.00000	-0.00000	0.00000	2.16000	2.16000	2.16000	-0.00000	-0.00000
17	-0.00000	-0.00000	-4.32000	44.82000	-4.32000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	-0.00000	-0.00000
18	0.00000	-0.00000	-3.24000	-4.32000	44.82000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	-0.00000	-0.00000
19	-1.62000	0.00000	1.08000	1.08000	1.08000	43.20000	-8.64000	-0.00000	0.00000	0.00000	0.00000	-1.08000	-.54000
20	-1.08000	-0.00000	0.00000	0.00000	0.00000	-8.64000	43.20000	0.00000	-0.00000	-0.00000	-0.00000	-.54000	-1.62000
21	3.78000	-6.48000	8.64000	8.64000	8.64000	-50.22000	-50.22000	50.76000	-51.30000	-51.30000	-51.30000	-4.86000	-4.86000
22	0.00000	-0.00000	-.54000	-.54000	-.54000	-0.00000	-0.00000	0.00000	43.20000	-2.16000	-2.16000	0.00000	0.00000
23	-0.00000	-0.00000	1.62000	1.62000	1.62000	0.00000	0.00000	-0.00000	-2.16000	43.20000	-4.32000	-0.00000	-0.00000
24	-0.00000	0.00000	.54000	.54000	1.08000	0.00000	0.00000	-0.00000	-2.16000	-2.16000	43.20000	0.00000	0.00000
25	0.00000	-0.00000	0.00000	0.00000	-0.00000	-2.16000	-2.16000	0.00000	-0.00000	-0.00000	-0.00000	33.48000	4.32000
26	0.00000	-0.00000	-.54000	-.54000	-.54000	-2.16000	-2.16000	0.00000	0.00000	0.00000	-0.00000	4.32000	33.48000
27	2.16000	-4.32000	6.48000	6.48000	6.48000	4.32000	4.32000	-4.32000	-4.32000	-4.32000	-4.32000	-51.84000	-51.84000
28	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	2.16000	2.16000	2.16000	-0.00000	-0.00000
29	0.00000	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	-0.00000	0.00000
30	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000
31	4.86000	-3.78000	2.70000	2.70000	2.70000	5.94000	5.94000	-5.94000	4.86000	4.86000	4.86000	6.48000	6.48000
32	-1.62000	1.62000	-1.08000	-1.08000	-1.08000	-2.16000	-2.16000	2.16000	-0.00000	-0.00000	-0.00000	-2.16000	-2.16000
33	-8.10000	8.10000	-8.10000	-8.10000	-8.10000	-11.34000	-11.34000	11.34000	-11.34000	-11.34000	-11.34000	-13.50000	-13.50000
34	0.00000	-0.00000	0.00000	0.00000	0.00000	-.54000	-.54000	.54000	0.00000	0.00000	0.00000	-1.62000	-1.62000
35	-0.00000	-.54000	1.08000	1.08000	1.08000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	.54000	.54000
36	1.62000	-.54000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	-.54000	-.54000	-.54000	-.54000	-.54000

From file:TRANSFER0

'L' matrix with ALL GAUGES WORKING

No	27	28	29	30	31	32	33	34	35	36
1	0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	-1.08000	1.08000	1.08000	1.08000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	-0.00000	-1.62000	-1.62000	-1.62000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00000	1.62000	1.62000	1.62000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	-3.24000	2.16000	2.16000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	-4.86000	5.94000	5.94000	5.94000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	-0.00000	.54000	.54000	.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	6.48000	-7.56000	-7.56000	-7.56000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	-0.00000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	2.16000	2.70000	2.70000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	0.00000	-1.08000	-1.08000	-1.08000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	52.38000	-52.92000	-52.92000	-52.92000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
28	-0.00000	43.74000	-4.32000	-3.24000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	0.00000	-4.32000	43.74000	-4.32000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	-3.24000	-4.32000	43.74000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	-6.48000	6.48000	6.48000	6.48000	5.40000	-5.40000	-2.16000	1.08000	1.08000	1.08000
32	-.54000	1.08000	1.08000	1.08000	-5.40000	5.40000	-5.40000	2.16000	2.16000	2.16000
33	12.96000	-12.42000	-12.42000	-12.42000	-10.80000	-10.80000	10.80000	-10.80000	-10.80000	-10.80000
34	.54000	0.00000	0.00000	0.00000	0.00000	0.00000	-5.40000	10.80000	-5.40000	-3.24000
35	-.54000	-2.16000	-2.16000	-1.08000	2.16000	2.16000	2.16000	-5.40000	10.80000	-5.40000
36	.54000	-1.08000	-1.08000	-1.08000	1.08000	1.08000	1.08000	-2.16000	-5.40000	10.80000

From file:TRANSFERO

'K' matrix with ALL GAUGES WORKING

No	1	2	3	4	5	6	7	8	9	10	11	12	13
1	.03104	.00418	0.00000	.00006	.00009	.00009	.00108	.00066	-0.00000	-.00008	-.00008	-.00008	.00104
2	.00135	.03135	-0.00000	.00034	.00036	.00036	.00082	-.00496	-0.00000	-.00006	-.00005	-.00006	.00044
3	.02128	.02334	.06182	.03613	.03713	.03678	-.00109	-.00599	-.00200	-.00410	-.00379	-.00401	.00137
4	-0.00000	-0.00000	-0.00000	.02384	.00071	.00044	0.00000	0.00000	0.00000	-.00136	-.00060	-.00106	0.00000
5	-0.00000	-0.00000	-0.00000	.00074	.02394	.00138	0.00000	0.00000	0.00000	-.00127	-.00155	-.00125	0.00000
6	-0.00000	-0.00000	-0.00000	.00074	.00136	.02398	-0.00000	-0.00000	0.00000	-.00129	-.00158	-.00153	-0.00000
7	.00154	.00169	0.00000	.00187	.00197	.00196	.02682	.00614	-0.00000	-.00030	-.00029	-.00029	.00206
8	-.00157	-.00172	-0.00000	-.00165	-.00175	-.00173	.00067	.03111	0.00000	.00026	.00025	.00026	-.00204
9	.00130	.00142	.00308	-.00236	-.00283	-.00346	.02732	.03674	.02032	.02814	.02870	.02750	-.00111
10	0.00000	0.00000	0.00000	-.00101	-.00078	-.00054	0.00000	0.00000	0.00000	.02366	.00261	.00157	0.00000
11	0.00000	0.00000	0.00000	-.00077	-.00109	-.00114	0.00000	0.00000	0.00000	.00280	.02342	.00274	-0.00000
12	0.00000	0.00000	0.00000	-.00018	-.00052	-.00134	0.00000	0.00000	0.00000	.00171	.00270	.02321	0.00000
13	-0.00000	-0.00000	-0.00000	.00005	.00068	.00068	.00087	.00118	0.00000	-.00005	-.00007	-.00006	.02468
14	-0.00000	-0.00000	-0.00000	.00001	.00013	.00013	.00087	.00118	0.00000	.00005	.00004	.00005	.00455
15	-.00093	-.00102	.00299	-.00212	-.00137	-.00122	.00281	.00401	.00272	-.00499	-.00479	-.00485	.02912
16	-0.00000	-0.00000	0.00000	.00008	.00009	.00011	0.00000	0.00000	0.00000	-.00146	-.00073	-.00116	0.00000
17	-0.00000	-0.00000	0.00000	.00010	.00012	.00015	0.00000	0.00000	0.00000	-.00133	-.00155	-.00130	0.00000
18	-0.00000	-0.00000	-0.00000	.00010	.00012	.00016	-0.00000	0.00000	0.00000	-.00132	-.00157	-.00153	-0.00000
19	-0.00000	-0.00000	-0.00000	-0.00000	.00003	.00002	.00008	.00010	0.00000	.00011	.00010	.00010	.00130
20	-0.00000	-0.00000	0.00000	0.00000	.00003	.00003	.00006	.00008	0.00000	.00002	.00002	.00002	.00100
21	-.00059	-.00065	.00148	.00017	.00027	.00029	.00135	.00195	.00187	-.00074	-.00079	-.00073	.00353
22	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	-.00004	-.00004	-.00004	0.00000
23	0.00000	0.00000	-0.00000	-.00001	-.00001	-.00002	0.00000	0.00000	0.00000	.00017	.00016	.00016	0.00000
24	-0.00000	-0.00000	-0.00000	-.00001	-.00001	-.00001	0.00000	0.00000	0.00000	.00008	.00008	.00008	0.00000
25	-0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	.00001	.00001	-0.00000	.00001	.00001	.00001	.00013
26	-0.00000	-0.00000	-0.00000	0.00000	.00001	.00001	.00001	.00001	0.00000	-.00005	-.00005	-.00005	.00013
27	.00095	.00105	-.00139	-.00073	-.00070	-.00067	.00097	.00111	.00149	-.00093	-.00097	-.00091	.00153
28	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	-.00002	-.00002	-.00002	0.00000
29	0.00000	0.00000	0.00000	0.00000	.00001	.00001	0.00000	0.00000	0.00000	-.00006	-.00006	-.00006	-0.00000
30	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	-.00002	-.00002	-.00002	-0.00000
31	.00784	.00860	.00504	-.00704	-.00756	-.00770	-.00067	-.00258	.00246	.00961	.00984	.00940	-.00811
32	.01114	.01221	-.01678	-.00783	-.00821	-.00823	-.00166	-.00462	-.00918	.00472	.00479	.00462	-.00457
33	-.01335	-.01464	-.00195	.01039	.01128	.01155	.00200	.00554	.00282	-.01665	-.01704	-.01628	.01570
34	-.01191	-.01306	.00554	.00868	.00949	.00975	.00298	.00643	.00760	-.01546	-.01585	-.01513	.01482
35	-.01000	-.01097	.01348	.00712	.00772	.00788	.00248	.00548	.00825	-.01055	-.01082	-.01032	.01094
36	-.00797	-.00874	.00959	.00555	.00592	.00602	.00167	.00396	.00711	-.00714	-.00729	-.00698	.00508

From file:TRANSFER0

'K' matrix with ALL GAUGES WORKING

No	14	15	16	17	18	19	20	21	22	23	24	25	26
1	.00101	-0.00000	.00048	.00048	.00044	.00019	.00019	-0.00000	-.00017	-.00017	-.00017	.00049	.00050
2	.00048	-0.00000	.00004	.00004	.00004	.00008	.00008	-0.00000	-.00005	-.00005	-.00006	.00020	.00020
3	.00146	.00341	.00125	.00124	.00106	.00020	.00020	.00258	.00669	.00669	.00701	.00054	.00054
4	-0.00000	0.00000	.00014	.00014	.00013	-0.00000	0.00000	-0.00000	-.00002	-.00002	-.00002	-0.00000	-0.00000
5	0.00000	0.00000	.00057	.00057	.00052	0.00000	0.00000	-0.00000	-.00010	-.00010	-.00010	-0.00000	-0.00000
6	-0.00000	0.00000	.00059	.00059	.00054	-0.00000	-0.00000	-0.00000	-.00010	-.00010	-.00011	-0.00000	-0.00000
7	.00141	0.00000	.00013	.00013	.00012	.00030	.00030	0.00000	-.00019	-.00019	-.00020	.00067	.00068
8	-.00239	-0.00000	-.00011	-.00011	-.00010	-.00040	-.00040	-0.00000	.00026	.00026	.00027	-.00097	-.00098
9	-.00210	-.00155	-.00246	-.00245	-.00225	-.00029	-.00029	.00029	.00117	.00117	.00122	-.00069	-.00070
10	0.00000	0.00000	-.00063	-.00063	-.00058	0.00000	0.00000	0.00000	.00011	.00011	.00011	0.00000	0.00000
11	0.00000	-0.00000	-.00166	-.00166	-.00152	0.00000	-0.00000	0.00000	.00028	.00028	.00030	0.00000	0.00000
12	0.00000	0.00000	-.00163	-.00162	-.00148	0.00000	0.00000	0.00000	.00028	.00028	.00029	0.00000	0.00000
13	.00452	-0.00000	-.00008	-.00008	-.00007	.00189	.00189	-0.00000	-.00004	-.00004	-.00004	.00049	.00052
14	.02465	0.00000	-.00042	-.00042	-.00039	.00189	.00189	-0.00000	.00007	.00007	.00007	.00049	.00052
15	.02902	.02082	.02832	.02827	.02585	.00387	.00387	-.00057	-.00634	-.00634	-.00665	.00179	.00186
16	0.00000	0.00000	.02366	.00281	.00075	0.00000	0.00000	-0.00000	-.00157	-.00157	-.00164	0.00000	0.00000
17	0.00000	-0.00000	.00273	.02308	.00250	-0.00000	0.00000	-0.00000	-.00168	-.00168	-.00176	-0.00000	-0.00000
18	-0.00000	0.00000	.00223	.00268	.02285	-0.00000	-0.00000	-0.00000	-.00165	-.00165	-.00173	-0.00000	0.00000
19	.00130	-0.00000	-.00077	-.00077	-.00070	.02436	.00507	0.00000	.00019	.00019	.00020	.00083	.00057
20	.00100	0.00000	-.00015	-.00015	-.00014	.00505	.02434	0.00000	.00005	.00005	.00005	.00043	.00124
21	.00348	.00234	-.00303	-.00303	-.00307	.02917	.02917	.01949	.02670	.02670	.02798	.00053	.00107
22	-0.00000	0.00000	.00027	.00027	.00023	-0.00000	-0.00000	0.00000	.02334	.00129	.00135	-0.00000	-0.00000
23	0.00000	-0.00000	-.00115	-.00115	-.00108	0.00000	-0.00000	0.00000	.00180	.02384	.00293	0.00000	-0.00000
24	0.00000	0.00000	-.00046	-.00047	-.00069	0.00000	0.00000	0.00000	.00158	.00158	.02371	0.00000	-0.00000
25	.00013	-0.00000	-.00009	-.00009	-.00008	.00168	.00168	-0.00000	-.00018	-.00018	-.00019	.03045	-.00382
26	.00013	0.00000	.00037	.00037	.00033	.00168	.00168	0.00000	.00028	.00028	.00029	-.00385	.03048
27	.00150	.00173	-.00029	-.00029	-.00026	.00347	.00347	.00150	-.00061	-.00061	-.00064	.02636	.02643
28	0.00000	-0.00000	.00012	.00012	.00013	0.00000	0.00000	-0.00000	-.00161	-.00161	-.00168	0.00000	0.00000
29	-0.00000	0.00000	.00044	.00044	.00042	-0.00000	-0.00000	0.00000	-.00170	-.00170	-.00178	-0.00000	-0.00000
30	-0.00000	-0.00000	.00012	.00012	.00013	-0.00000	-0.00000	-0.00000	-.00161	-.00161	-.00168	-0.00000	0.00000
31	-.00807	.00313	.00756	.00754	.00692	.00035	.00035	-.00709	-.00346	-.00346	-.00363	.01002	.01003
32	-.00448	-.01202	.00435	.00434	.00411	.00143	.00143	-.02435	-.01326	-.01326	-.01389	.01288	.01291
33	.01559	.00599	-.01107	-.01105	-.01024	-.00264	-.00264	.02025	.01433	.01433	.01501	-.03422	-.03427
34	.01469	.01215	-.01129	-.01128	-.01045	-.00203	-.00203	.02808	.01454	.01454	.01524	-.02744	-.02748
35	.01083	.01300	-.00932	-.00930	-.00863	-.00131	-.00131	.02637	.01224	.01224	.01283	-.01808	-.01811
36	.00500	.01010	-.00417	-.00417	-.00391	-.00136	-.00136	.01983	.00964	.00964	.01010	-.01346	-.01349

From file:TRANSFER0

'K' matrix with ALL GAUGES WORKING

No	27	28	29	30	31	32	33	34	35	36
1	-0.00000	.00052	.00053	.00052	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.00000	.00029	.00029	.00029	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	.00115	-.00067	-.00045	-.00043	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	-0.00000	.00001	.00001	.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	-0.00000	.00003	.00003	.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	-0.00000	.00003	.00003	.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	0.00000	.00099	.00101	.00099	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	-0.00000	-.00143	-.00146	-.00142	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	.00114	.00001	.00005	.00005	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	-.00004	-.00003	-.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	0.00000	-.00010	-.00009	-.00009	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	-.00010	-.00009	-.00009	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	-0.00000	.00032	.00032	.00031	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	-0.00000	-.00002	-.00001	-.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	.00223	.00165	.00147	.00143	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	0.00000	.00033	.00028	.00027	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	-0.00000	.00068	.00064	.00062	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	-0.00000	.00067	.00063	.00061	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	0.00000	-.00041	-.00041	-.00040	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	-.00014	-.00014	-.00013	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	-.00205	-.00470	-.00388	-.00378	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	-.00133	-.00030	-.00027	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	-.00178	-.00202	-.00198	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	-.00161	-.00160	-.00156	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	-0.00000	.00115	.00116	.00114	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	0.00000	-.00200	-.00204	-.00199	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	.01913	.02732	.02792	.02730	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
28	0.00000	.02354	.00273	.00220	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	0.00000	.00280	.02361	.00274	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	.00225	.00273	.02348	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	-.00577	.02721	.02751	.01841	.09013	-.00246	.06282	.31028	.37751	.33614
32	-.02034	.02510	.02503	.01679	-.05073	.04186	.05243	.28073	.34156	.30413
33	.00573	-.03481	-.03482	-.02192	-.26103	-.26103	-.15588	-.44326	-.53930	-.48020
34	.01757	-.03815	-.03822	-.02486	-.18059	-.18059	-.16171	-.39401	-.55654	-.50401
35	.02182	-.02641	-.02639	-.01722	-.07059	-.07059	-.11582	-.36446	-.38170	-.39483
36	.01567	-.02123	-.02121	-.01354	-.04925	-.04925	-.08619	-.27581	-.32013	-.22163

From file:TRANSFER1

'L' matrix to be used before March 5, 1987 (when gauges #13 and #1 were not functioning)

No	1	2	3	4	5	6	7	8	9	10	11	12	13
1	32.40000	-4.32000	-0.00000	0.00000	0.00000	-0.00000	-1.08000	-1.08000	-0.00000	0.00000	-0.00000	0.00000	-1.08000
2	-1.08000	32.40000	0.00000	0.00000	0.00000	0.00000	-1.08000	5.40000	0.00000	-0.00000	0.00000	-0.00000	0.00000
3	-10.80000	-10.80000	16.20000	-23.22000	-23.22000	-23.22000	-.54000	-.54000	2.16000	-3.24000	-3.24000	-3.24000	2.16000
4	-0.00000	-0.00000	-0.00000	42.12000	-1.08000	-.54000	0.00000	0.00000	-0.00000	2.16000	.54000	1.62000	-0.00000
5	-0.00000	-0.00000	0.00000	-1.08000	42.12000	-2.16000	-0.00000	-0.00000	0.00000	1.62000	2.16000	1.62000	0.00000
6	-0.00000	-0.00000	0.00000	-1.08000	-2.16000	42.12000	-0.00000	-0.00000	0.00000	1.62000	2.16000	2.16000	0.00000
7	-2.16000	-2.16000	0.00000	-3.24000	-3.24000	-3.24000	37.80000	-7.56000	-0.00000	-0.00000	-0.00000	-0.00000	-3.24000
8	1.62000	1.62000	0.00000	2.16000	2.16000	2.16000	-1.08000	32.40000	-0.00000	0.00000	0.00000	0.00000	2.16000
9	0.00000	-0.00000	-2.70000	5.40000	5.40000	5.40000	-48.60000	-48.60000	48.60000	-48.60000	-48.60000	-48.60000	-2.16000
10	-0.00000	0.00000	-0.00000	1.62000	1.08000	.54000	-0.00000	-0.00000	-0.00000	43.20000	-4.32000	-2.16000	-0.00000
11	0.00000	-0.00000	-0.00000	1.08000	1.62000	1.62000	0.00000	0.00000	-0.00000	-4.32000	44.28000	-4.32000	-0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	44.28000	0.00000
13	0.00000	-0.00000	-0.00000	-0.00000	-1.08000	-1.08000	-1.08000	-1.08000	-0.00000	-0.00000	0.00000	-0.00000	42.12000
14	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-1.08000	-1.08000	-0.00000	0.00000	0.00000	0.00000	-7.56000
15	3.24000	3.24000	-2.16000	7.56000	7.56000	7.56000	4.32000	4.32000	-6.48000	8.64000	8.64000	8.64000	-48.06000
16	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	2.16000	.54000	1.62000	0.00000
17	-0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	1.62000	2.16000	1.62000	0.00000
18	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	1.62000	2.16000	2.16000	-0.00000
19	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-1.62000
20	0.00000	0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	-1.08000
21	1.08000	1.08000	-.54000	0.00000	0.00000	0.00000	2.16000	2.16000	-4.32000	6.48000	6.48000	6.48000	3.78000
22	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000
23	-0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000
24	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	-0.00000
25	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000
26	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000
27	-2.70000	-2.70000	1.62000	-1.08000	-1.08000	-1.08000	1.62000	1.62000	-2.70000	4.32000	4.32000	4.32000	2.16000
28	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000
29	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000
30	-0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000
31	2.16000	2.16000	-2.16000	2.16000	2.16000	2.16000	2.70000	2.70000	-2.70000	1.08000	1.08000	1.08000	4.86000
32	-1.08000	-1.08000	.54000	-0.00000	-0.00000	-0.00000	-1.08000	-1.08000	1.08000	-.54000	-.54000	-.54000	-1.62000
33	-1.08000	-1.08000	2.70000	-4.32000	-4.32000	-4.32000	-4.32000	-4.32000	4.32000	-4.32000	-4.32000	-4.32000	-8.10000
34	-1.08000	-1.08000	.54000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000
35	0.00000	-0.00000	-.54000	1.08000	1.08000	1.08000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000
36	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000

From file:TRANSFER1

'L' matrix to be used before March 5, 1987 (when gauges #13 and #1 were not functioning)

No	14	15	16	17	18	19	20	21	22	23	24	25	26
1	-1.08000	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-.54000	-.54000
2	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000
3	2.16000	-2.16000	2.16000	2.16000	2.16000	2.16000	2.16000	-2.16000	-2.16000	-2.16000	-2.16000	1.08000	1.08000
4	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000
5	0.00000	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000
6	0.00000	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000
7	-2.16000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	-1.08000	-1.08000
8	2.70000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	1.08000	1.08000
9	-2.16000	4.32000	-7.02000	-7.02000	-7.02000	0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	3.78000	3.78000
10	-0.00000	0.00000	.54000	.54000	.54000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000
11	-0.00000	0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	-7.56000	0.00000	0.00000	-0.00000	-0.00000	-2.16000	-2.16000	0.00000	0.00000	0.00000	0.00000	-.54000	-.54000
14	42.12000	0.00000	.54000	.54000	.54000	-2.16000	-2.16000	0.00000	-0.00000	-0.00000	0.00000	-.54000	-.54000
15	-48.06000	48.06000	-48.06000	-48.06000	-48.06000	-2.16000	-2.16000	2.16000	2.16000	2.16000	2.16000	3.24000	3.24000
16	0.00000	0.00000	43.20000	-4.86000	-.54000	-0.00000	-0.00000	-0.00000	2.16000	2.16000	2.16000	-0.00000	0.00000
17	0.00000	-0.00000	-4.32000	44.82000	-4.32000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	-0.00000	-0.00000
18	-0.00000	0.00000	-3.24000	-4.32000	44.82000	-0.00000	-0.00000	0.00000	2.16000	2.16000	2.16000	0.00000	0.00000
19	-1.62000	-0.00000	1.08000	1.08000	1.08000	43.20000	-8.64000	-0.00000	-0.00000	0.00000	0.00000	-1.08000	-.54000
20	-1.08000	-0.00000	0.00000	0.00000	0.00000	-8.64000	43.20000	0.00000	-0.00000	-0.00000	-0.00000	-.54000	-1.62000
21	3.78000	-6.48000	8.64000	8.64000	8.64000	-50.22000	-50.22000	50.76000	-51.30000	-51.30000	-51.30000	-4.86000	-4.86000
22	0.00000	-0.00000	-.54000	-.54000	-.54000	-0.00000	-0.00000	0.00000	43.20000	-2.16000	-2.16000	0.00000	0.00000
23	-0.00000	0.00000	1.62000	1.62000	1.62000	0.00000	0.00000	-0.00000	-2.16000	43.20000	-4.32000	-0.00000	-0.00000
24	-0.00000	0.00000	.54000	.54000	1.08000	-0.00000	-0.00000	0.00000	-2.16000	-2.16000	43.20000	0.00000	0.00000
25	0.00000	-0.00000	0.00000	-0.00000	-0.00000	-2.16000	-2.16000	0.00000	0.00000	-0.00000	-0.00000	33.48000	4.32000
26	0.00000	-0.00000	-.54000	-.54000	-.54000	-2.16000	-2.16000	0.00000	0.00000	0.00000	0.00000	4.32000	33.48000
27	2.16000	-4.32000	6.48000	6.48000	6.48000	4.32000	4.32000	-4.32000	-4.32000	-4.32000	-4.32000	-51.84000	-51.84000
28	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	2.16000	2.16000	2.16000	-0.00000	-0.00000
29	0.00000	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000
30	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000
31	4.86000	-3.78000	2.70000	2.70000	2.70000	5.94000	5.94000	-5.94000	4.86000	4.86000	4.86000	6.48000	6.48000
32	-1.62000	1.62000	-1.08000	-1.08000	-1.08000	-2.16000	-2.16000	2.16000	-0.00000	-0.00000	-0.00000	-2.16000	-2.16000
33	-8.10000	8.10000	-8.10000	-8.10000	-8.10000	-11.34000	-11.34000	11.34000	-11.34000	-11.34000	-11.34000	-13.50000	-13.50000
34	0.00000	-0.00000	0.00000	0.00000	0.00000	-.54000	-.54000	.54000	0.00000	0.00000	0.00000	-1.62000	-1.62000
35	-0.00000	-.54000	1.08000	1.08000	1.08000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	.54000	.54000
36	-0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

From file:TRANSFER1

'L' matrix to be used before March 5, 1987 (when gauges #13 and 41 were not functioning)

No	27	28	29	30	31	32	33	34	35	36
1	0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	-1.08000	1.08000	1.08000	1.08000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	-0.00000	-1.62000	-1.62000	-1.62000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00000	1.62000	1.62000	1.62000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	-3.24000	2.16000	2.16000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	-4.86000	5.94000	5.94000	5.94000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	-0.00000	.54000	.54000	.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	6.48000	-7.56000	-7.56000	-7.56000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	-0.00000	2.16000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	2.16000	2.70000	2.70000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	0.00000	-1.08000	-1.08000	-1.08000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	52.38000	-52.92000	-52.92000	-52.92000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
28	-0.00000	43.74000	-4.32000	-3.24000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	0.00000	-4.32000	43.74000	-4.32000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	-3.24000	-4.32000	43.74000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	-6.48000	6.48000	6.48000	6.48000	5.40000	-5.40000	-2.16000	1.08000	1.08000	1.08000
32	-.54000	1.08000	1.08000	1.08000	-5.40000	5.40000	-5.40000	2.16000	2.16000	2.16000
33	12.96000	-12.42000	-12.42000	-12.42000	-10.80000	-10.80000	10.80000	-10.80000	-10.80000	-10.80000
34	.54000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	-5.40000	10.80000	-5.40000	-3.24000
35	-.54000	-2.16000	-2.16000	-1.08000	2.16000	2.16000	2.16000	-5.40000	10.80000	-5.40000
36	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	10.80000

From file:TRANSFER1

'K' matrix to be used before March 5, 1987 (when gauges #13 and 41 were not functioning)

No	1	2	3	4	5	6	7	8	9	10	11	12	13
1	.03104	.00418	0.00000	.00006	.00009	.00008	.00108	.00066	0.00000	-.00007	-.00007	-.00008	.00104
2	.00135	.03135	-0.00000	.00034	.00036	.00035	.00082	-.00496	-0.00000	-.00005	-.00005	-.00005	.00044
3	.02128	.02334	.06182	.03610	.03704	.03655	-.00109	-.00599	-.00200	-.00381	-.00333	-.00390	.00137
4	0.00000	0.00000	0.00000	.02383	.00068	.00038	-0.00000	-0.00000	0.00000	-.00129	-.00047	-.00103	-0.00000
5	-0.00000	-0.00000	0.00000	.00073	.02391	.00130	-0.00000	-0.00000	-0.00000	-.00118	-.00141	-.00122	-0.00000
6	-0.00000	-0.00000	-0.00000	.00073	.00133	.02389	-0.00000	-0.00000	-0.00000	-.00118	-.00141	-.00149	-0.00000
7	.00154	.00169	-0.00000	.00187	.00196	.00194	.02682	.00614	-0.00000	-.00028	-.00025	-.00029	.00206
8	-.00157	-.00172	-0.00000	-.00165	-.00174	-.00172	.00067	.03111	0.00000	.00025	.00022	.00025	-.00204
9	.00130	.00142	.00308	-.00215	-.00222	-.00187	.02732	.03674	.02032	.02612	.02551	.02675	-.00111
10	0.00000	0.00000	0.00000	-.00100	-.00075	-.00045	0.00000	0.00000	0.00000	.02355	.00242	.00153	0.00000
11	0.00000	0.00000	-0.00000	-.00074	-.00102	-.00098	0.00000	0.00000	-0.00000	.00260	.02310	.00267	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	.02258	0.00000
13	-0.00000	-0.00000	0.00000	.00004	.00068	.00068	.00087	.00118	0.00000	-.00005	-.00006	-.00006	.02468
14	-0.00000	-0.00000	-0.00000	.00001	.00013	.00013	.00087	.00118	0.00000	.00004	.00004	.00004	.00455
15	-.00093	-.00102	.00299	-.00216	-.00148	-.00151	.00281	.00401	.00272	-.00463	-.00423	-.00472	.02912
16	-0.00000	0.00000	0.00000	.00007	.00006	.00004	-0.00000	-0.00000	-0.00000	-.00137	-.00059	-.00113	-0.00000
17	-0.00000	-0.00000	0.00000	.00009	.00009	.00008	-0.00000	-0.00000	-0.00000	-.00124	-.00140	-.00126	-0.00000
18	-0.00000	-0.00000	0.00000	.00009	.00009	.00007	-0.00000	-0.00000	0.00000	-.00121	-.00139	-.00149	-0.00000
19	-0.00000	-0.00000	-0.00000	-0.00000	.00003	.00003	.00008	.00010	0.00000	.00010	.00009	.00010	.00130
20	-0.00000	-0.00000	0.00000	0.00000	.00003	.00003	.00006	.00008	0.00000	.00002	.00002	.00002	.00100
21	-.00059	-.00065	.00148	.00016	.00026	.00025	.00135	.00195	.00187	-.00069	-.00071	-.00071	.00353
22	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	-.00004	-.00003	-.00004	-0.00000
23	0.00000	0.00000	-0.00000	-.00001	-.00001	-.00001	0.00000	0.00000	0.00000	.00015	.00014	.00016	0.00000
24	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	.00007	.00007	.00008	0.00000
25	-0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	.00001	.00001	-0.00000	.00001	.00001	.00001	.00013
26	-0.00000	-0.00000	-0.00000	0.00000	.00001	.00001	.00001	.00001	0.00000	-.00005	-.00004	-.00005	.00013
27	.00095	.00105	-.00139	-.00074	-.00072	-.00072	.00097	.00111	.00149	-.00087	-.00086	-.00089	.00153
28	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-.00002	-.00002	-.00002	-0.00000
29	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	-.00006	-.00005	-.00006	-0.00000
30	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-.00002	-.00002	-.00002	0.00000
31	-.00425	-.00466	.01958	.00137	.00139	.00136	.00186	.00342	.01324	-.00113	-.00107	-.00115	-.00040
32	.00020	.00022	-.00362	-.00026	-.00020	-.00026	.00063	.00081	.00058	-.00471	-.00463	-.00482	.00241
33	.00392	.00430	-.02273	-.00164	-.00156	-.00156	-.00162	-.00303	-.01258	-.00110	-.00112	-.00113	.00468
34	.00622	.00682	-.01626	-.00393	-.00395	-.00389	-.00092	-.00257	-.00857	.00071	.00063	.00073	.00326
35	.00420	.00461	-.00361	-.00275	-.00277	-.00271	-.00050	-.00157	-.00442	.00201	.00191	.00205	.00188
36	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000

From file:TRANSFER1

'K' matrix to be used before March 5, 1987 (when gauges #13 and #1 were not functioning)

No	14	15	16	17	18	19	20	21	22	23	24	25	26
1	.00101	0.00000	.00048	.00048	.00044	.00019	.00019	-0.00000	-.00016	-.00016	-.00017	.00049	.00050
2	.00048	0.00000	.00003	.00003	.00003	.00008	.00008	-0.00000	-.00005	-.00005	-.00006	.00020	.00020
3	.00146	.00341	.00097	.00096	.00080	.00020	.00020	.00258	.00674	.00674	.00706	.00054	.00054
4	-0.00000	0.00000	.00006	.00006	.00006	-0.00000	-0.00000	0.00000	-.00001	-.00001	-.00001	-0.00000	-0.00000
5	-0.00000	-0.00000	.00049	.00048	.00044	-0.00000	-0.00000	0.00000	-.00008	-.00008	-.00009	-0.00000	-0.00000
6	-0.00000	-0.00000	.00049	.00048	.00044	-0.00000	-0.00000	-0.00000	-.00008	-.00008	-.00009	-0.00000	-0.00000
7	.00141	0.00000	.00010	.00010	.00010	.00030	.00030	-0.00000	-.00018	-.00018	-.00019	.00067	.00068
8	-.00239	-0.00000	-.00009	-.00009	-.00009	-.00040	-.00040	-0.00000	.00026	.00026	.00027	-.00097	-.00098
9	-.00210	-.00155	-.00053	-.00053	-.00050	-.00029	-.00029	.00029	.00084	.00084	.00088	-.00069	-.00070
10	0.00000	0.00000	-.00052	-.00052	-.00048	0.00000	0.00000	0.00000	.00009	.00009	.00009	0.00000	0.00000
11	0.00000	-0.00000	-.00147	-.00147	-.00134	0.00000	0.00000	0.00000	.00025	.00025	.00026	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	.00452	0.00000	-.00009	-.00009	-.00008	.00189	.00189	0.00000	-.00004	-.00004	-.00004	.00049	.00052
14	.02465	-0.00000	-.00042	-.00042	-.00038	.00189	.00189	-0.00000	.00007	.00007	.00007	.00049	.00052
15	.02902	.02082	.02799	.02793	.02554	.00387	.00387	-.00057	-.00629	-.00629	-.00658	.00179	.00186
16	-0.00000	-0.00000	.02358	.00273	.00067	-0.00000	-0.00000	0.00000	-.00155	-.00155	-.00163	-0.00000	-0.00000
17	-0.00000	-0.00000	.00264	.02298	.00242	-0.00000	-0.00000	-0.00000	-.00167	-.00167	-.00175	-0.00000	-0.00000
18	-0.00000	-0.00000	.00212	.00257	.02276	-0.00000	-0.00000	-0.00000	-.00163	-.00163	-.00171	-0.00000	-0.00000
19	.00130	0.00000	-.00076	-.00076	-.00070	.02436	.00507	0.00000	.00019	.00019	.00020	.00083	.00057
20	.00100	0.00000	-.00015	-.00015	-.00014	.00505	.02434	-0.00000	.00005	.00005	.00005	.00043	.00124
21	.00348	.00234	-.00308	-.00308	-.00312	.02917	.02917	.01949	.02671	.02671	.02799	.00053	.00107
22	-0.00000	0.00000	.00027	.00027	.00023	-0.00000	-0.00000	0.00000	.02334	.00129	.00135	-0.00000	-0.00000
23	0.00000	0.00000	-.00114	-.00113	-.00107	0.00000	0.00000	0.00000	.00179	.02384	.00293	0.00000	0.00000
24	0.00000	-0.00000	-.00046	-.00046	-.00068	0.00000	0.00000	0.00000	.00158	.00158	.02370	0.00000	-0.00000
25	.00013	0.00000	-.00008	-.00008	-.00007	.00168	.00168	-0.00000	-.00018	-.00018	-.00019	.03045	-.00382
26	.00013	0.00000	.00037	.00036	.00033	.00168	.00168	-0.00000	.00028	.00028	.00029	-.00385	.03048
27	.00150	.00173	-.00035	-.00035	-.00031	.00347	.00347	.00150	-.00060	-.00060	-.00063	.02636	.02643
28	0.00000	-0.00000	.00012	.00012	.00013	0.00000	0.00000	-0.00000	-.00161	-.00161	-.00168	0.00000	0.00000
29	0.00000	0.00000	.00044	.00044	.00042	-0.00000	-0.00000	-0.00000	-.00170	-.00170	-.00178	-0.00000	-0.00000
30	0.00000	-0.00000	.00012	.00012	.00013	0.00000	-0.00000	-0.00000	-.00161	-.00161	-.00168	-0.00000	-0.00000
31	-.00048	.01845	.00114	.00114	.00091	-.00172	-.00172	.02299	.01117	.01117	.01170	-.01040	-.01043
32	.00238	.00184	-.00172	-.00172	-.00157	-.00044	-.00044	.00287	.00002	.00002	.00003	-.00559	-.00560
33	.00475	-.01590	-.00211	-.00210	-.00184	.00031	.00031	-.02272	-.00654	-.00654	-.00685	-.00505	-.00505
34	.00331	-.01082	-.00175	-.00175	-.00151	.00107	.00107	-.01702	-.00738	-.00738	-.00773	.00317	.00319
35	.00191	-.00499	-.00174	-.00173	-.00152	.00112	.00112	-.00896	-.00495	-.00495	-.00519	.00590	.00592
36	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

From file:TRANSFER1

'K' matrix to be used before March 5, 1987 (when gauges #13 and #1 were not functioning)

No	27	28	29	30	31	32	33	34	35	36
1	-0.00000	.00052	.00053	.00052	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.00000	.00029	.00029	.00029	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	.00115	-.00068	-.00046	-.00045	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	-0.00000	.00003	.00003	.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	-0.00000	.00003	.00003	.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	-0.00000	.00099	.00101	.00099	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00000	-.00143	-.00146	-.00142	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	.00114	.00012	.00016	.00015	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	-.00003	-.00003	-.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	0.00000	-.00009	-.00008	-.00008	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	-0.00000	.00032	.00032	.00031	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	-0.00000	-.00002	-.00001	-.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	.00223	.00163	.00145	.00141	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	-0.00000	.00032	.00028	.00027	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	-0.00000	.00067	.00063	.00062	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	-0.00000	.00067	.00062	.00061	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	-0.00000	-.00041	-.00041	-.00040	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	-0.00000	-.00014	-.00014	-.00013	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	-.00205	-.00470	-.00389	-.00378	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	-.00133	-.00030	-.00027	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	-.00178	-.00201	-.00197	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	-.00161	-.00160	-.00156	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	-0.00000	.00115	.00116	.00114	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	0.00000	-.00200	-.00204	-.00199	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	.01913	.02732	.02791	.02730	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
28	-0.00000	.02354	.00273	.00220	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	-0.00000	.00280	.02361	.00274	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	.00225	.00273	.02348	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	.01800	-.00499	-.00466	-.00212	.01543	-.07716	-.06790	-.10802	-.10802	-.14043
32	.00117	-.00406	-.00418	-.00181	-.11831	-.02572	-.06584	-.09774	-.09774	-.12706
33	-.02823	.01118	.01112	.00741	-.15432	-.15432	.03096	.15432	.15432	.20062
34	-.01808	.01012	.01001	.00593	-.06859	-.06859	.03429	.23320	.17147	.21056
35	-.00610	.01141	.01140	.00691	.01715	.01715	.03772	.12689	.18861	.16495
36	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	.09259

From file:TRANSFER2

"L" matrix to be used March 5, 1987 and later (when gauges #4 was not functioning)

No	1	2	3	4	5	6	7	8	9	10	11	12	13
1	32.40000	-4.32000	0.00000	-0.00000	-0.00000	-0.00000	-1.08000	-1.08000	-0.00000	0.00000	0.00000	0.00000	-1.08000
2	-1.08000	32.40000	-0.00000	0.00000	0.00000	0.00000	-1.08000	5.40000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000
3	-10.80000	-10.80000	16.20000	-23.22000	-23.22000	-23.22000	-.54000	-.54000	2.16000	-3.24000	-3.24000	-3.24000	2.16000
4	-0.00000	-0.00000	-0.00000	42.12000	-1.08000	-.54000	0.00000	0.00000	-0.00000	2.16000	.54000	1.62000	-0.00000
5	-0.00000	0.00000	-0.00000	-1.08000	42.12000	-2.16000	0.00000	0.00000	-0.00000	1.62000	2.16000	1.62000	-0.00000
6	-0.00000	-0.00000	0.00000	-1.08000	-2.16000	42.12000	-0.00000	-0.00000	0.00000	1.62000	2.16000	2.16000	0.00000
7	-2.16000	-2.16000	0.00000	-3.24000	-3.24000	-3.24000	37.80000	-7.56000	-0.00000	-0.00000	-0.00000	-0.00000	-3.24000
8	1.62000	1.62000	0.00000	2.16000	2.16000	2.16000	-1.08000	32.40000	0.00000	-0.00000	-0.00000	-0.00000	2.16000
9	0.00000	-0.00000	-2.70000	5.40000	5.40000	5.40000	-48.60000	-48.60000	48.60000	-48.60000	-48.60000	-48.60000	-2.16000
10	0.00000	0.00000	-0.00000	1.62000	1.08000	.54000	-0.00000	-0.00000	-0.00000	43.20000	-4.32000	-2.16000	0.00000
11	-0.00000	-0.00000	-0.00000	1.08000	1.62000	1.62000	-0.00000	-0.00000	0.00000	-4.32000	44.28000	-4.32000	-0.00000
12	0.00000	-0.00000	-0.00000	-0.00000	.54000	2.16000	0.00000	0.00000	-0.00000	-2.16000	-4.32000	44.28000	-0.00000
13	-0.00000	-0.00000	-0.00000	0.00000	-1.08000	-1.08000	-1.08000	-1.08000	-0.00000	0.00000	0.00000	0.00000	42.12000
14	-0.00000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	-1.08000	-1.08000	-0.00000	0.00000	0.00000	-0.00000	-7.56000
15	3.24000	3.24000	-2.16000	7.56000	7.56000	7.56000	4.32000	4.32000	-6.48000	8.64000	8.64000	8.64000	-48.06000
16	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	2.16000	.54000	1.62000	-0.00000
17	-0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	1.62000	2.16000	1.62000	0.00000
18	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	1.62000	2.16000	2.16000	0.00000
19	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	-1.62000
20	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	-1.08000
21	1.08000	1.08000	-.54000	-0.00000	0.00000	0.00000	2.16000	2.16000	-4.32000	6.48000	6.48000	6.48000	3.78000
22	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000
23	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000
24	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000
25	0.00000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000
26	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000
27	-2.70000	-2.70000	1.62000	-1.08000	-1.08000	-1.08000	1.62000	1.62000	-2.70000	4.32000	4.32000	4.32000	2.16000
28	-0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000
29	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	-0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	-0.00000	-0.00000
31	2.16000	2.16000	-2.16000	2.16000	2.16000	2.16000	2.70000	2.70000	-2.70000	1.08000	1.08000	1.08000	4.86000
32	-1.08000	-1.08000	.54000	-0.00000	-0.00000	-0.00000	-1.08000	-1.08000	1.08000	-.54000	-.54000	-.54000	-1.62000
33	-1.08000	-1.08000	2.70000	-4.32000	-4.32000	-4.32000	-4.32000	-4.32000	4.32000	-4.32000	-4.32000	-4.32000	-8.10000
34	-1.08000	-1.08000	.54000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	-0.00000	-0.00000	0.00000
35	0.00000	-0.00000	-.54000	1.08000	1.08000	1.08000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000
36	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000

From file:TRANSFER2

'L' matrix to be used March 5, 1987 and later (when gauges 841 was not functioning)

No	14	15	16	17	18	19	20	21	22	23	24	25	26
1	-1.08000	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-.54000	-.54000
2	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000
3	2.16000	-2.16000	2.16000	2.16000	2.16000	2.16000	2.16000	-2.16000	-2.16000	-2.16000	-2.16000	1.08000	1.08000
4	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000
5	-0.00000	-0.00000	-.54000	-.54000	-.54000	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000
6	0.00000	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000
7	-2.16000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-1.08000	-1.08000
8	2.70000	0.00000	-0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	1.08000	1.08000
9	-2.16000	4.32000	-7.02000	-7.02000	-7.02000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	3.78000	3.78000
10	-0.00000	0.00000	.54000	.54000	.54000	0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000	-0.00000
11	-0.00000	0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000
12	-0.00000	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000
13	-7.56000	0.00000	0.00000	-0.00000	-0.00000	-2.16000	-2.16000	0.00000	0.00000	0.00000	0.00000	-.54000	-.54000
14	12.12000	-0.00000	.54000	.54000	.54000	-2.16000	-2.16000	0.00000	-0.00000	-0.00000	0.00000	-.54000	-.54000
15	-48.06000	48.06000	-48.06000	-48.06000	-48.06000	-2.16000	-2.16000	2.16000	2.16000	2.16000	2.16000	3.24000	3.24000
16	-0.00000	0.00000	13.20000	-4.86000	-.54000	-0.00000	-0.00000	0.00000	2.16000	2.16000	2.16000	0.00000	0.00000
17	0.00000	-0.00000	-4.32000	14.82000	-4.32000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	-0.00000	-0.00000
18	0.00000	0.00000	-3.24000	-4.32000	14.82000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000
19	-1.62000	-0.00000	1.08000	1.08000	1.08000	13.20000	-8.64000	-0.00000	0.00000	0.00000	0.00000	-1.08000	-.54000
20	-1.08000	-0.00000	0.00000	0.00000	-0.00000	-8.64000	13.20000	0.00000	-0.00000	0.00000	0.00000	-.54000	-1.62000
21	3.78000	-6.48000	8.64000	8.64000	8.64000	-50.22000	-50.22000	50.76000	-51.30000	-51.30000	-51.30000	-4.86000	-4.86000
22	0.00000	-0.00000	-.54000	-.54000	-.54000	-0.00000	-0.00000	0.00000	13.20000	-2.16000	-2.16000	-0.00000	0.00000
23	-0.00000	0.00000	1.62000	1.62000	1.62000	0.00000	0.00000	-0.00000	-2.16000	13.20000	-4.32000	-0.00000	-0.00000
24	-0.00000	0.00000	.54000	.54000	1.08000	-0.00000	-0.00000	-0.00000	-2.16000	-2.16000	13.20000	0.00000	0.00000
25	0.00000	-0.00000	0.00000	0.00000	-0.00000	-2.16000	-2.16000	0.00000	-0.00000	-0.00000	-0.00000	33.48000	4.32000
26	0.00000	-0.00000	-.54000	-.54000	-.54000	-2.16000	-2.16000	0.00000	0.00000	0.00000	-0.00000	4.32000	33.48000
27	2.16000	-4.32000	6.48000	6.48000	6.48000	4.32000	4.32000	-4.32000	-4.32000	-4.32000	-4.32000	-51.84000	-51.84000
28	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	2.16000	2.16000	2.16000	-0.00000	-0.00000
29	0.00000	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	-0.00000	-0.00000
30	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000
31	4.86000	-3.78000	2.70000	2.70000	2.70000	5.94000	5.94000	-5.94000	4.86000	4.86000	4.86000	6.48000	6.48000
32	-1.62000	1.62000	-1.08000	-1.08000	-1.08000	-2.16000	-2.16000	2.16000	-0.00000	-0.00000	-0.00000	-2.16000	-2.16000
33	-8.10000	8.10000	-8.10000	-8.10000	-8.10000	-11.34000	-11.34000	11.34000	-11.34000	-11.34000	-11.34000	-13.50000	-13.50000
34	0.00000	-0.00000	0.00000	0.00000	0.00000	-.54000	-.54000	.54000	0.00000	0.00000	0.00000	-1.62000	-1.62000
35	-0.00000	-.54000	1.08000	1.08000	1.08000	-0.00000	-0.00000	0.00000	-0.00000	-0.00000	-0.00000	.54000	.54000
36	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000

From file:TRANSFER2

'L' matrix to be used March 5, 1987 and later (when gauges #41 was not functioning)

No	27	28	29	30	31	32	33	34	35	36
1	0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	-1.08000	1.08000	1.08000	1.08000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	-0.00000	-1.62000	-1.62000	-1.62000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00000	1.62000	1.62000	1.62000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	-3.24000	2.16000	2.16000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	-4.86000	5.94000	5.94000	5.94000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	-0.00000	-.54000	-.54000	-.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	-0.00000	.54000	.54000	.54000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	6.48000	-7.56000	-7.56000	-7.56000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	2.16000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	2.16000	2.70000	2.70000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	-0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	0.00000	-1.08000	-1.08000	-1.08000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	0.00000	2.16000	2.16000	2.16000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	52.38000	-52.92000	-52.92000	-52.92000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
28	0.00000	43.74000	-4.32000	-3.24000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	0.00000	-4.32000	43.74000	-4.32000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	-3.24000	-4.32000	43.74000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	-6.48000	6.48000	6.48000	6.48000	5.40000	-5.40000	-2.16000	1.08000	1.08000	1.08000
32	-.54000	1.08000	1.08000	1.08000	-5.40000	5.40000	-5.40000	2.16000	2.16000	2.16000
33	12.96000	-12.42000	-12.42000	-12.42000	-10.80000	-10.80000	10.80000	-10.80000	-10.80000	-10.80000
34	.54000	-0.00000	-0.00000	-0.00000	-0.00000	0.00000	-5.40000	10.80000	-5.40000	-3.24000
35	-.54000	-2.16000	-2.16000	-1.08000	2.16000	2.16000	2.16000	-5.40000	10.80000	-5.40000
36	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	10.80000

From file:TRANSFER2

'K' matrix to be used March 5, 1987 and later (when gauges #41 was not functioning)

No	1	2	3	4	5	6	7	8	9	10	11	12	13
1	.03104	.00418	0.00000	.00006	.00009	.00009	.00108	.00066	0.00000	-.00008	-.00008	-.00008	.00104
2	.00135	.03135	0.00000	.00034	.00036	.00036	.00082	-.00496	-0.00000	-.00006	-.00005	-.00006	.00044
3	.02128	.02334	.06182	.03613	.03713	.03678	-.00109	-.00599	-.00200	-.00410	-.00379	-.00401	.00137
4	0.00000	-0.00000	0.00000	.02384	.00071	.00044	0.00000	0.00000	0.00000	-.00136	-.00060	-.00106	-0.00000
5	-0.00000	-0.00000	0.00000	.00074	.02394	.00138	0.00000	0.00000	0.00000	-.00127	-.00155	-.00125	0.00000
6	-0.00000	-0.00000	-0.00000	.00074	.00136	.02398	-0.00000	-0.00000	0.00000	-.00129	-.00158	-.00153	-0.00000
7	.00154	.00169	-0.00000	.00187	.00197	.00196	.02682	.00614	-0.00000	-.00030	-.00029	-.00029	.00206
8	.00157	-.00172	-0.00000	-.00165	-.00175	-.00173	.00067	.03111	-0.00000	.00026	.00025	.00026	-.00204
9	.00130	.00142	.00308	-.00236	-.00283	-.00346	.02732	.03674	.02032	.02814	.02870	.02750	-.00111
10	0.00000	0.00000	0.00000	-.00101	-.00078	-.00054	0.00000	0.00000	-0.00000	.02366	.00261	.00157	0.00000
11	0.00000	0.00000	0.00000	-.00077	-.00109	-.00114	0.00000	0.00000	-0.00000	.00280	.02342	.00274	0.00000
12	-0.00000	0.00000	0.00000	-.00018	-.00052	-.00134	0.00000	0.00000	0.00000	.00171	.00270	.02321	0.00000
13	-0.00000	-0.00000	0.00000	.00005	.00068	.00068	.00087	.00118	0.00000	-.00005	-.00007	-.00006	.02468
14	-0.00000	-0.00000	0.00000	.00001	.00013	.00013	.00087	.00118	0.00000	.00005	.00004	.00005	.00455
15	-.00093	-.00102	.00299	-.00212	-.00137	-.00122	.00281	.00401	.00272	-.00499	-.00479	-.00485	.02912
16	0.00000	0.00000	0.00000	.00008	.00009	.00011	0.00000	0.00000	0.00000	-.00146	-.00073	-.00116	0.00000
17	-0.00000	-0.00000	0.00000	.00010	.00012	.00015	0.00000	0.00000	0.00000	-.00133	-.00155	-.00130	0.00000
18	-0.00000	-0.00000	0.00000	.00010	.00012	.00016	-0.00000	-0.00000	0.00000	-.00132	-.00157	-.00153	-0.00000
19	-0.00000	-0.00000	-0.00000	-0.00000	.00003	.00002	.00008	.00010	0.00000	.00011	.00010	.00010	.00130
20	-0.00000	-0.00000	0.00000	0.00000	.00003	.00003	.00006	.00008	0.00000	.00002	.00002	.00002	.00100
21	-.00059	-.00065	.00148	.00017	.00027	.00029	.00135	.00195	.00187	-.00074	-.00079	-.00073	.00353
22	-0.00000	-0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	0.00000	0.00000	-.00004	-.00004	-.00004	0.00000
23	0.00000	0.00000	-0.00000	-.00001	-.00001	-.00002	0.00000	0.00000	0.00000	.00017	.00016	.00016	0.00000
24	-0.00000	0.00000	-0.00000	-.00001	-.00001	-.00001	0.00000	0.00000	0.00000	.00008	.00008	.00008	0.00000
25	-0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	.00001	.00001	-0.00000	.00001	.00001	.00001	.00013
26	-0.00000	-0.00000	-0.00000	0.00000	.00001	.00001	.00001	.00001	0.00000	-.00005	-.00005	-.00005	.00013
27	.00095	.00105	-.00139	-.00073	-.00070	-.00067	.00097	.00111	.00149	-.00093	-.00097	-.00091	.00153
28	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-.00002	-.00002	-.00002	-0.00000
29	0.00000	0.00000	0.00000	0.00000	.00001	.00001	-0.00000	-0.00000	0.00000	-.00006	-.00006	-.00006	-0.00000
30	-0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	-0.00000	-.00002	-.00002	-.00002	0.00000
31	-.00425	-.00466	.01958	.00138	.00142	.00143	.00186	.00342	.01324	-.00121	-.00121	-.00118	-.00040
32	.00020	.00022	-.00362	-.00022	-.00009	.00003	.00063	.00081	.00058	-.00507	-.00520	-.00496	.00241
33	.00392	.00430	-.02273	-.00163	-.00154	-.00149	-.00162	-.00303	-.01258	-.00118	-.00125	-.00116	.00468
34	.00622	.00682	-.01626	-.00394	-.00397	-.00394	-.00092	-.00257	-.00857	.00077	.00072	.00075	.00326
35	.00420	.00461	-.00361	-.00277	-.00282	-.00284	-.00050	-.00157	-.00442	.00216	.00216	.00211	.00188
36	0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000

From file:TRANSFER2

"K" matrix to be used March 5, 1987 and later (when gauges #41 was not functioning)

No	14	15	16	17	18	19	20	21	22	23	24	25	26
1	.00101	0.00000	.00048	.00048	.00044	.00019	.00019	-0.00000	-.00017	-.00017	-.00017	.00049	.00050
2	.00048	0.00000	.00004	.00004	.00004	.00008	.00008	-0.00000	-.00005	-.00005	-.00006	.00020	.00020
3	.00146	.00341	.00125	.00124	.00106	.00020	.00020	.00258	.00669	.00669	.00701	.00054	.00054
4	-0.00000	-0.00000	.00014	.00014	.00013	-0.00000	-0.00000	-0.00000	-.00002	-.00002	-.00002	-0.00000	0.00000
5	0.00000	-0.00000	.00057	.00057	.00052	0.00000	0.00000	-0.00000	-.00010	-.00010	-.00010	-0.00000	-0.00000
6	-0.00000	0.00000	.00059	.00059	.00054	-0.00000	-0.00000	-0.00000	-.00010	-.00010	-.00011	-0.00000	-0.00000
7	.00141	0.00000	.00013	.00013	.00012	.00030	.00030	-0.00000	-.00019	-.00019	-.00020	.00067	.00068
8	-.00239	-0.00000	-.00011	-.00011	-.00010	-.00040	-.00040	-0.00000	.00026	.00026	.00027	-.00097	-.00098
9	-.00210	-.00155	-.00246	-.00245	-.00225	-.00029	-.00029	.00029	.00117	.00117	.00122	-.00069	-.00070
10	0.00000	0.00000	-.00063	-.00063	-.00058	0.00000	0.00000	0.00000	.00011	.00011	.00011	0.00000	0.00000
11	0.00000	0.00000	-.00166	-.00166	-.00152	0.00000	0.00000	0.00000	.00028	.00028	.00030	0.00000	0.00000
12	0.00000	0.00000	-.00163	-.00162	-.00148	0.00000	0.00000	0.00000	.00028	.00028	.00029	0.00000	0.00000
13	.00452	0.00000	-.00008	-.00008	-.00007	.00189	.00189	0.00000	-.00004	-.00004	-.00004	.00049	.00052
14	.02465	0.00000	-.00042	-.00042	-.00039	.00189	.00189	0.00000	.00007	.00007	.00007	.00049	.00052
15	.02902	.02082	.02832	.02827	.02585	.00387	.00387	-.00057	-.00634	-.00634	-.00665	.00179	.00186
16	0.00000	-0.00000	.02366	.00281	.00075	0.00000	0.00000	-0.00000	-.00157	-.00157	-.00164	0.00000	0.00000
17	0.00000	0.00000	.00273	.02308	.00250	0.00000	0.00000	-0.00000	-.00168	-.00168	-.00176	-0.00000	-0.00000
18	-0.00000	0.00000	.00223	.00268	.02285	-0.00000	-0.00000	-0.00000	-.00165	-.00165	-.00173	-0.00000	-0.00000
19	.00130	0.00000	-.00077	-.00077	-.00070	.02436	.00507	0.00000	.00019	.00019	.00020	.00083	.00057
20	.00100	0.00000	-.00015	-.00015	-.00014	.00505	.02434	-0.00000	.00005	.00005	.00005	.00043	.00124
21	.00348	.00234	-.00303	-.00303	-.00307	.02917	.02917	.01949	.02670	.02670	.02798	.00053	.00107
22	-0.00000	0.00000	.00027	.00027	.00023	0.00000	0.00000	0.00000	.02334	.00129	.00135	0.00000	-0.00000
23	0.00000	0.00000	-.00115	-.00115	-.00108	0.00000	0.00000	0.00000	.00180	.02384	.00293	0.00000	0.00000
24	0.00000	-0.00000	-.00046	-.00047	-.00069	0.00000	0.00000	0.00000	.00158	.00158	.02371	0.00000	-0.00000
25	.00013	0.00000	-.00009	-.00009	-.00008	.00168	.00168	-0.00000	-.00018	-.00018	-.00019	.03045	-.00382
26	.00013	0.00000	.00037	.00037	.00033	.00168	.00168	-0.00000	.00028	.00028	.00029	-.00385	.03048
27	.00150	.00173	-.00029	-.00029	-.00026	.00347	.00347	.00150	-.00061	-.00061	-.00064	.02636	.02643
28	-0.00000	-0.00000	.00012	.00012	.00013	-0.00000	-0.00000	-0.00000	-.00161	-.00161	-.00168	-0.00000	-0.00000
29	0.00000	0.00000	.00044	.00044	.00042	-0.00000	-0.00000	-0.00000	-.00170	-.00170	-.00178	-0.00000	-0.00000
30	0.00000	-0.00000	.00012	.00012	.00013	-0.00000	-0.00000	-0.00000	-.00161	-.00161	-.00168	-0.00000	-0.00000
31	-.00048	.01845	.00123	.00122	.00099	-.00172	-.00172	.02299	.01115	.01115	.01168	-.01040	-.01043
32	.00238	.00184	-.00138	-.00137	-.00125	-.00044	-.00044	.00287	-.00004	-.00004	-.00004	-.00559	-.00560
33	.00475	-.01590	-.00203	-.00202	-.00177	.00031	.00031	-.02272	-.00655	-.00655	-.00686	-.00505	-.00505
34	.00331	-.01082	-.00180	-.00180	-.00156	.00107	.00107	-.01702	-.00737	-.00737	-.00772	.00317	.00319
35	.00191	-.00499	-.00189	-.00188	-.00166	.00112	.00112	-.00896	-.00493	-.00493	-.00516	.00590	.00592
36	0.00000	0.00000	-0.00000	0.00000	-0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	0.00000	0.00000	-0.00000

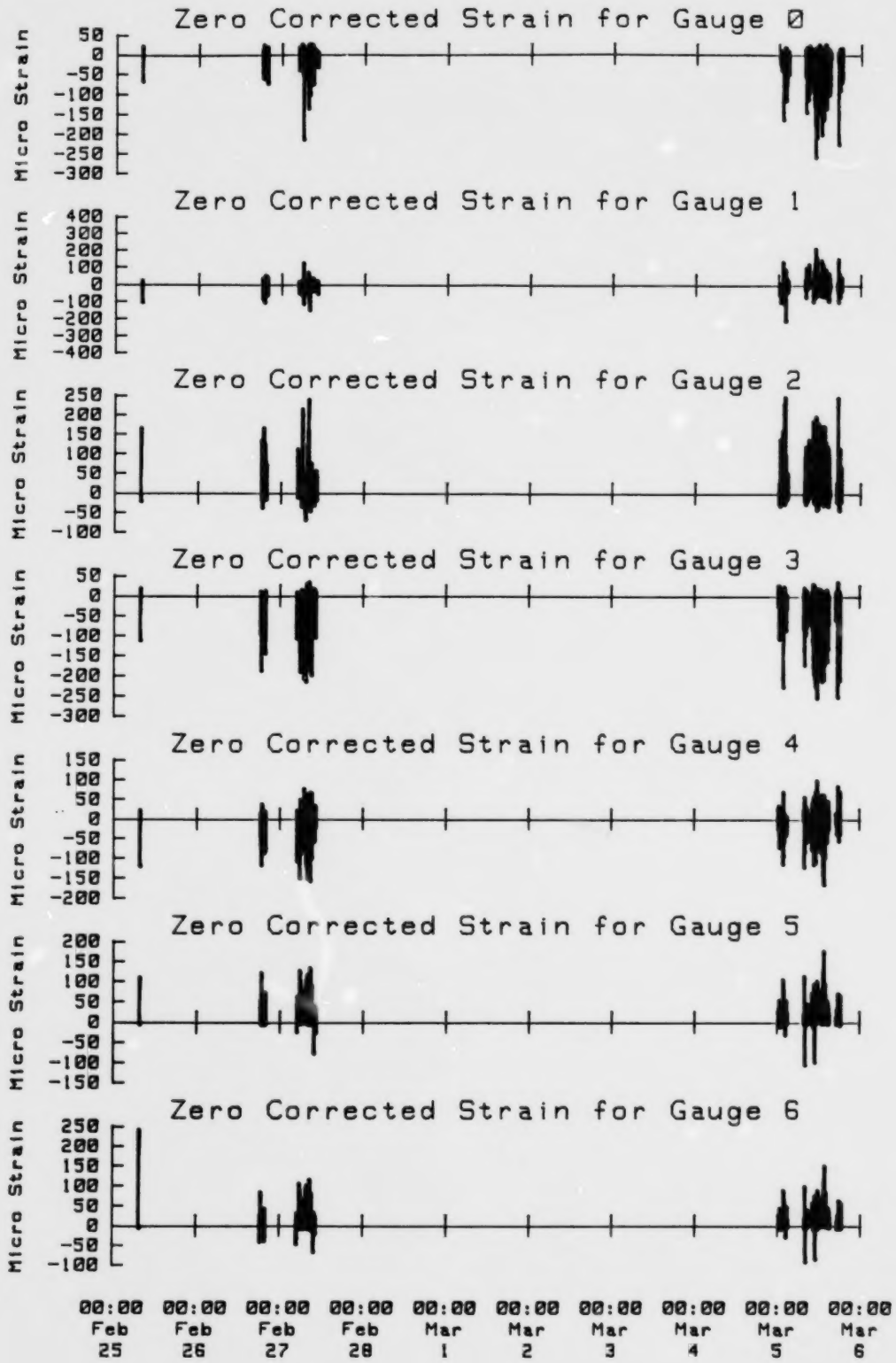
From file:TRANSFER2

'K' matrix to be used March 5, 1987 and later (when gauges #41 was not functioning)

No	27	28	29	30	31	32	33	34	35	36
1	-0.00000	.00052	.00053	.00052	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	-0.00000	.00029	.00029	.00029	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	.00115	-.00067	-.00045	-.00043	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	-0.00000	.00001	.00001	.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	-0.00000	.00003	.00003	.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	-0.00000	.00003	.00003	.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	-0.00000	.00099	.00101	.00099	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	-0.00000	-.00143	-.00146	-.00142	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	.00114	.00001	.00005	.00005	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	-.00004	-.00003	-.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	0.00000	-.00010	-.00009	-.00009	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	-.00010	-.00009	-.00009	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	-0.00000	.00032	.00032	.00031	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	-0.00000	-.00002	-.00001	-.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	.00223	.00165	.00147	.00143	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	0.00000	.00033	.00028	.00027	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	-0.00000	.00068	.00064	.00062	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	-0.00000	.00067	.00063	.00061	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	-0.00000	-.00041	-.00041	-.00040	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	-0.00000	-.00014	-.00014	-.00013	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	-.00205	-.00470	-.00388	-.00378	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	-.00133	-.00030	-.00027	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	-.00178	-.00202	-.00198	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	-.00161	-.00160	-.00156	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	-0.00000	.00115	.00116	.00114	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	0.00000	-.00200	-.00204	-.00199	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	.01913	.02732	.02792	.02730	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
28	-0.00000	.02354	.00273	.00220	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	-0.00000	.00280	.02361	.00274	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	.00225	.00273	.02348	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	.01800	-.00499	-.00466	-.00212	.01543	-.07716	-.06790	-.10802	-.10802	-.14043
32	.00117	-.00403	-.00408	-.00179	-.11831	-.02572	-.06584	-.09774	-.09774	-.12706
33	-.02823	.01118	.01113	.00741	-.15432	-.15432	.03086	.15432	.15432	.20062
34	-.01808	.01012	.01001	.00593	-.06859	-.06859	.03429	.23320	.17147	.21056
35	-.00610	.01140	.01139	.00690	.01715	.01715	.03772	.12689	.18861	.16495
36	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00000	-0.00000	.09259

APPENDIX C

TIME SERIES PLOTS OF STRAIN DATA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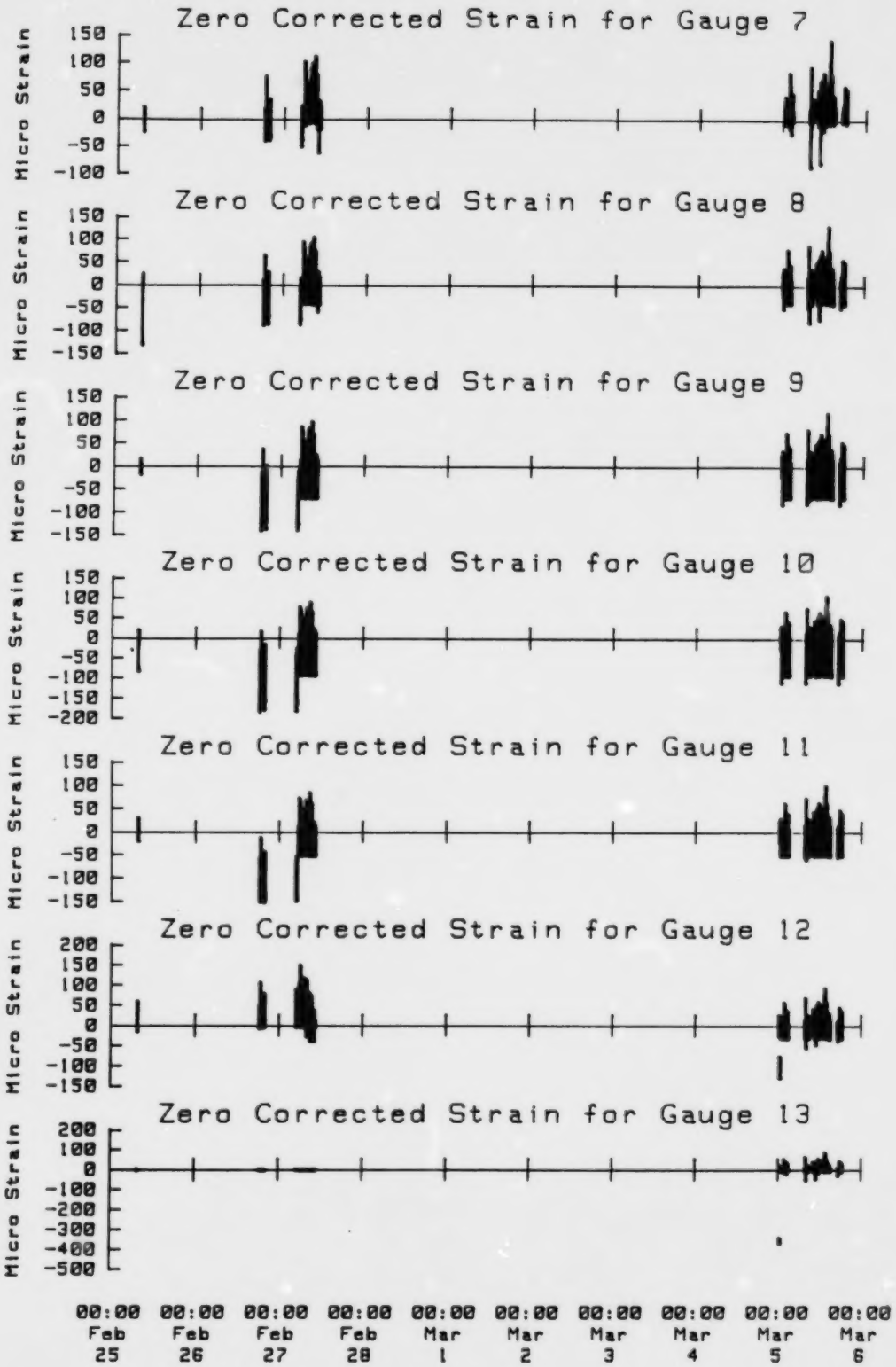
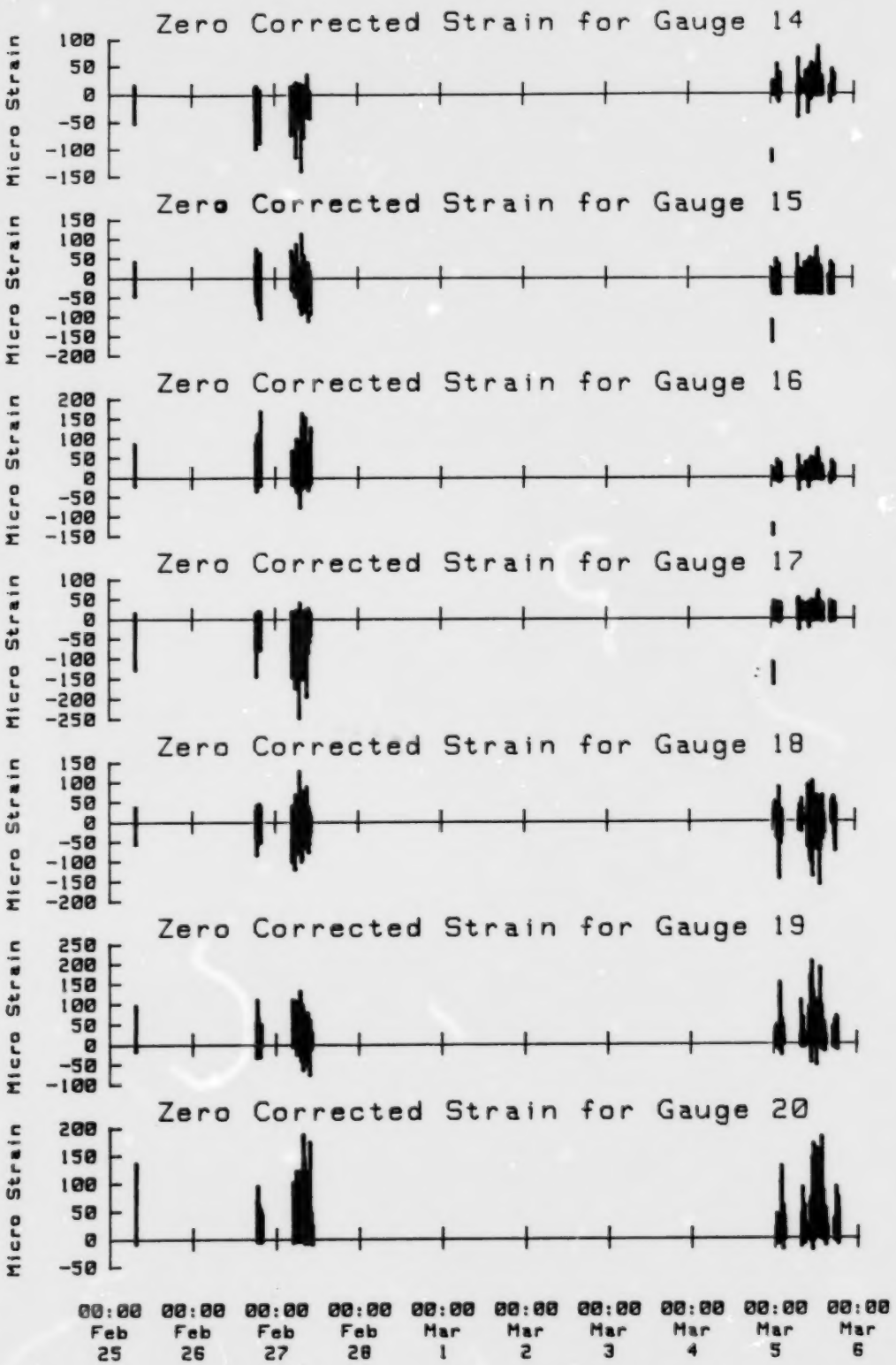
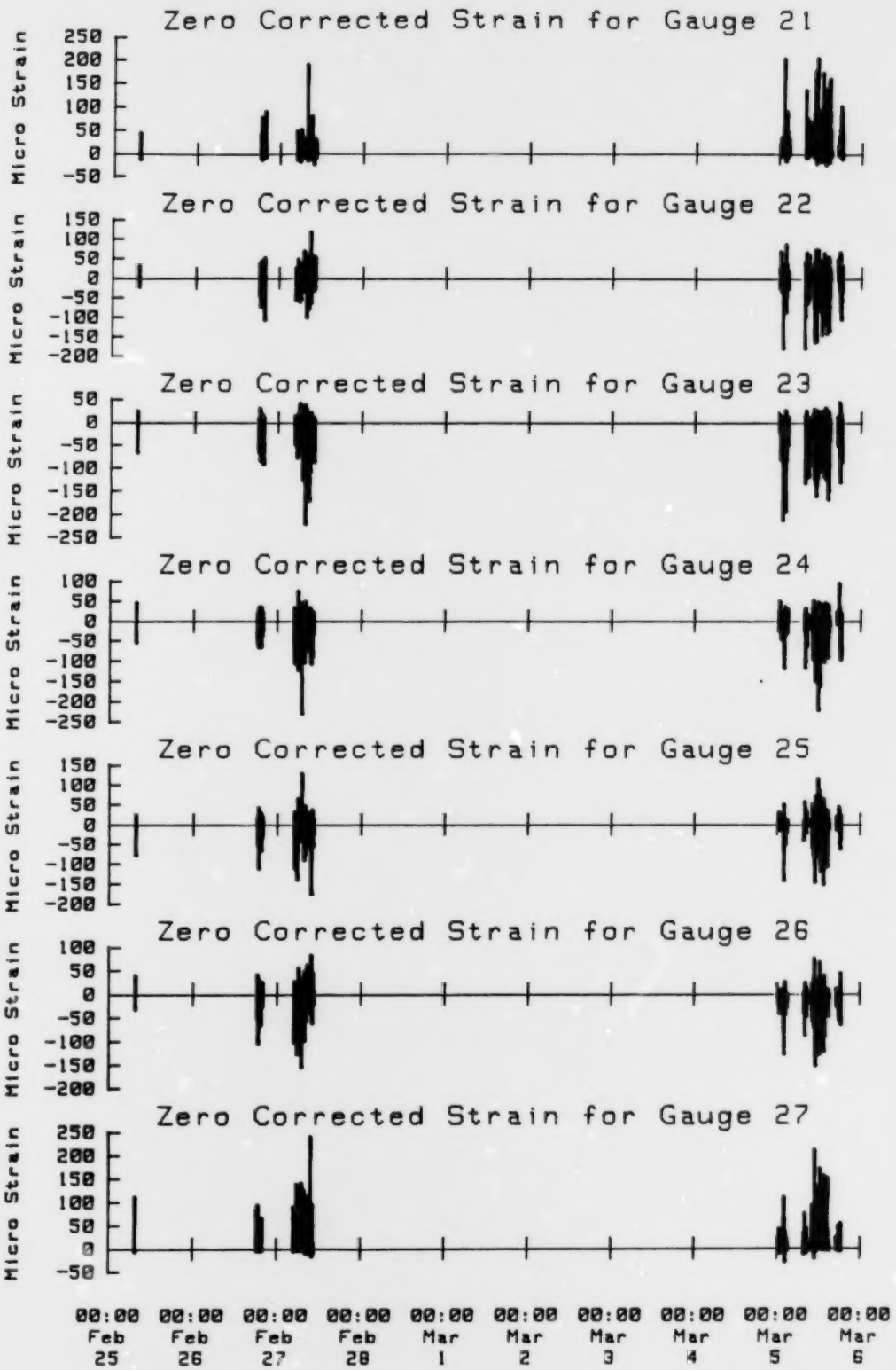
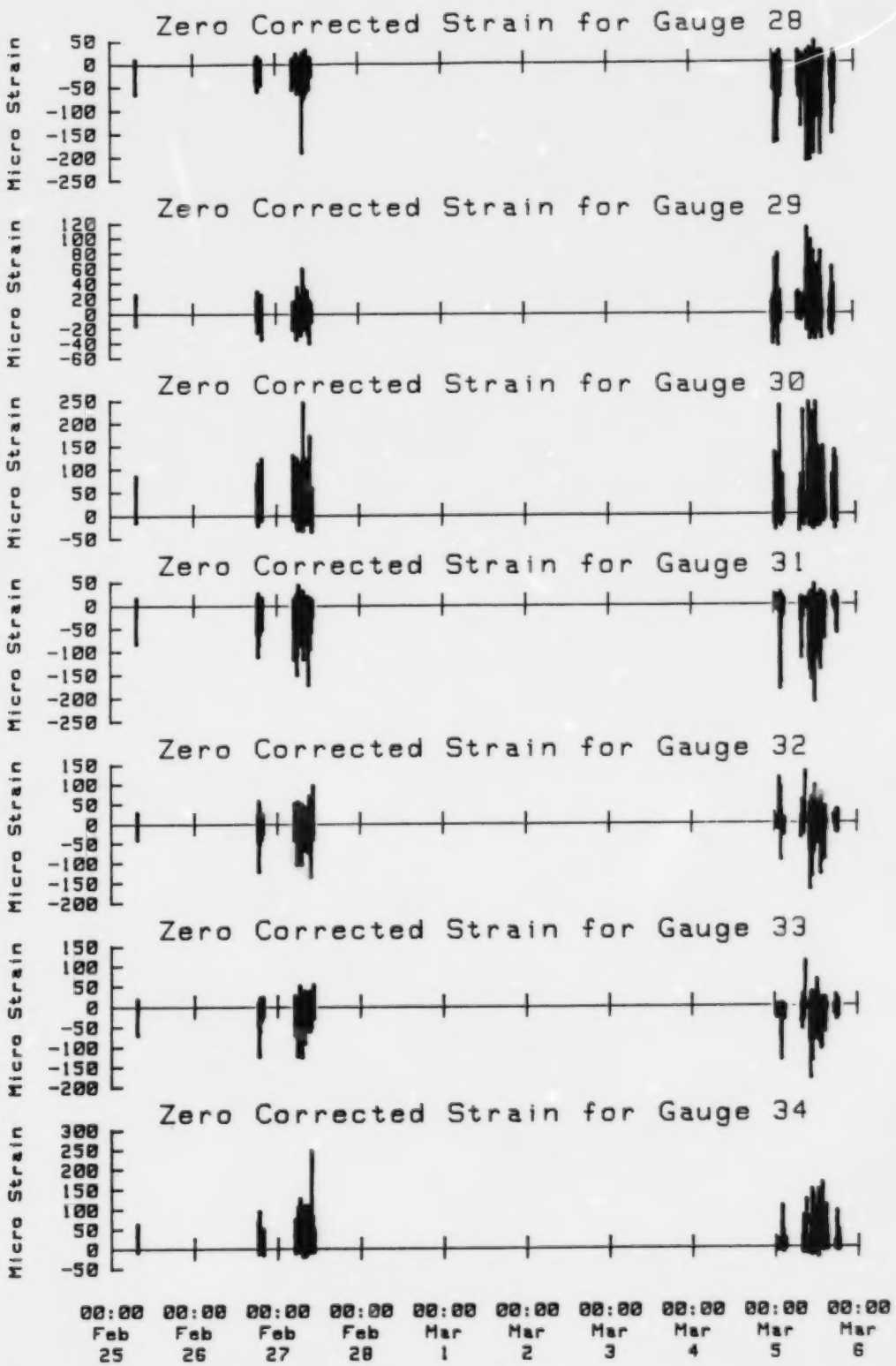
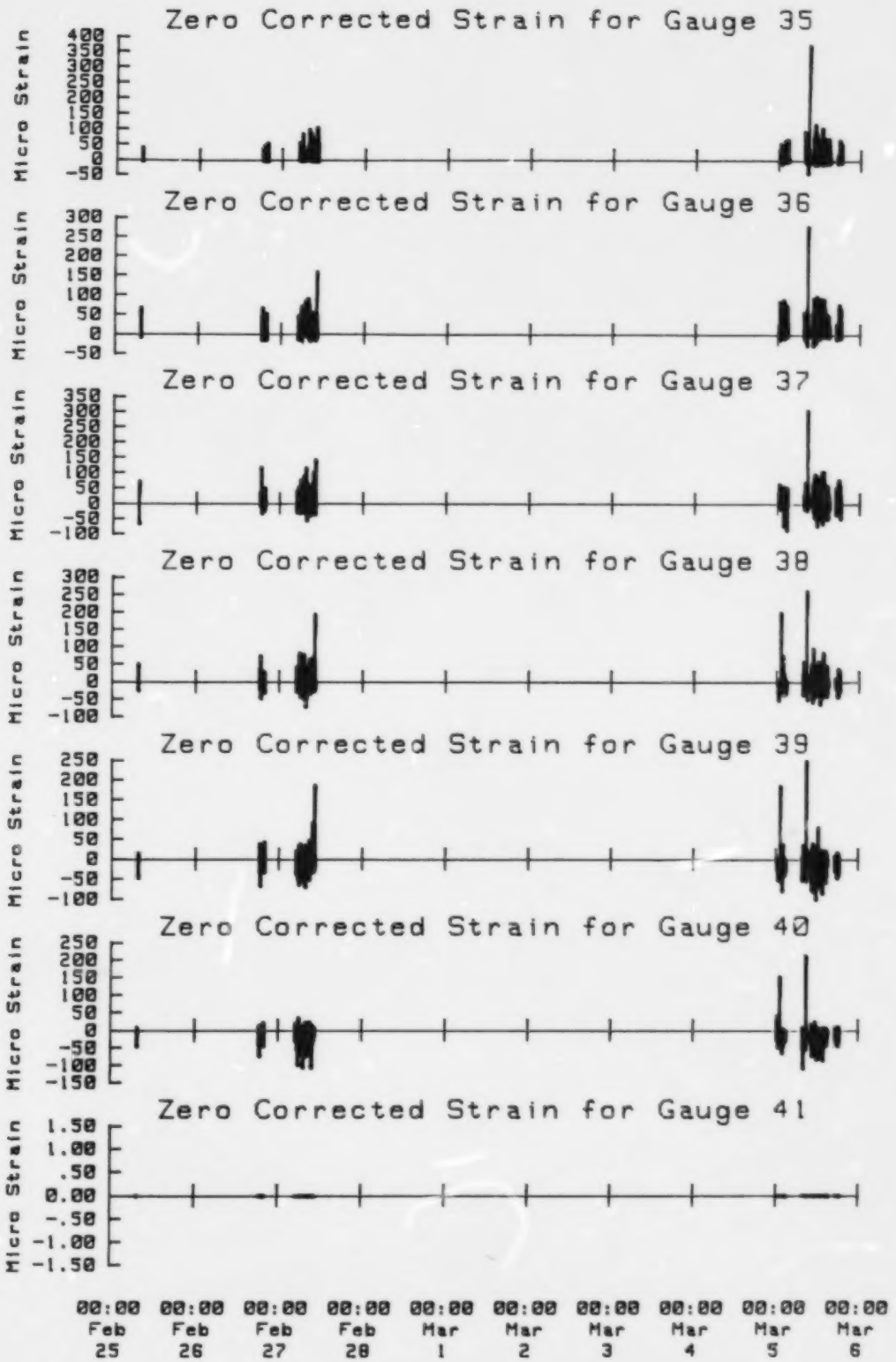
Micro Strain
50
0
-50
-100
-150
-200
-250
-300
Zero Corrected Strain for Gauge 1
Micro Strain
400
300
200
100
0
-100
-200
-300
-400
Zero Corrected Strain for Gauge 2
Micro Strain
250
200
150
100
50
0
-50
-100
Zero Corrected Strain for Gauge 3
Micro Strain
50
0
-50
-100
-150
-200
-250
-300
Zero Corrected Strain for Gauge 4
Micro Strain
150
100
50
0
-50
-100
-150
-200
Zero Corrected Strain for Gauge 5
Micro Strain
200
150
100
50
0
-50
-100
-150
Zero Corrected Strain for Gauge 6
Micro Strain
250
200
150
100
50
0
-50
-100
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6

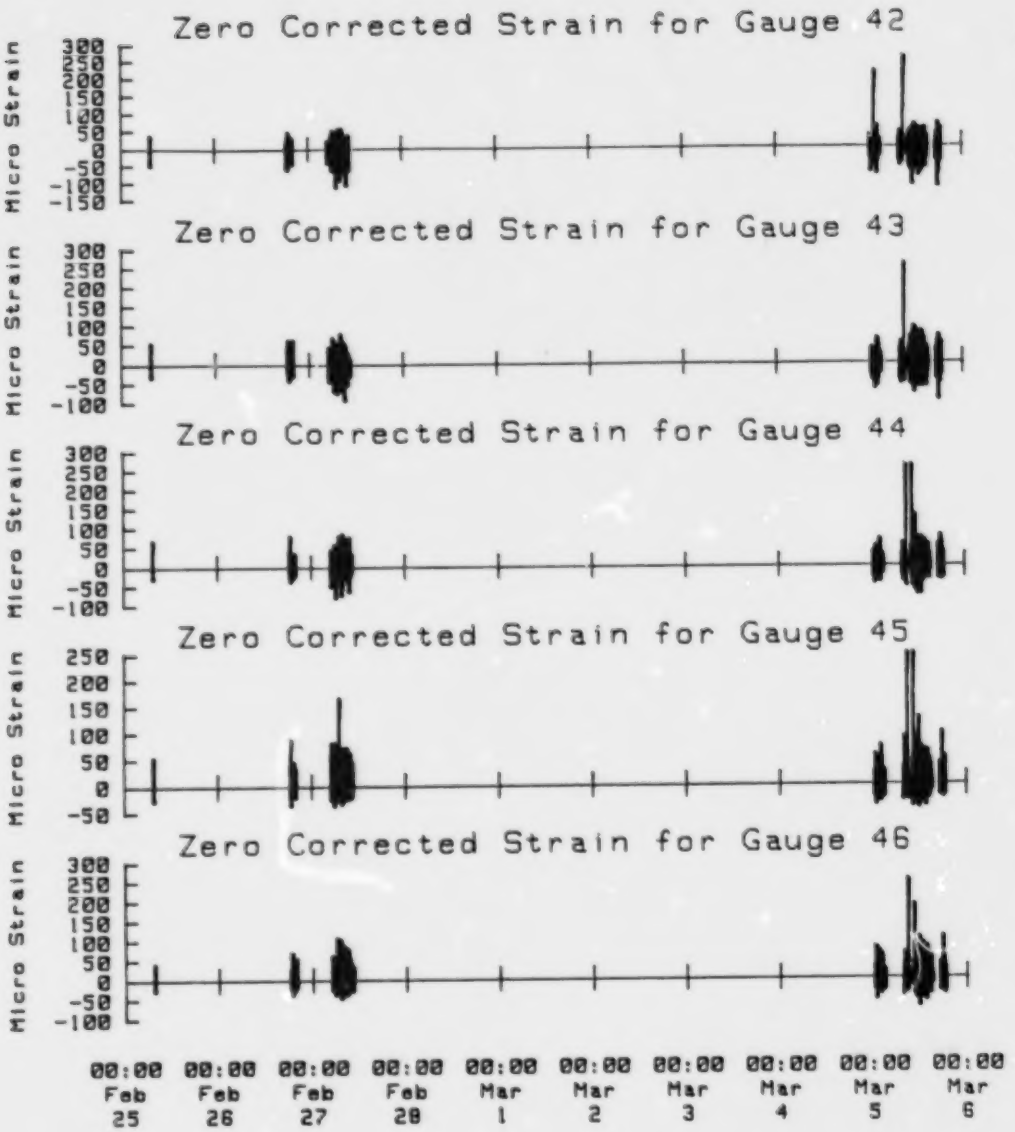

Zero Corrected Strain for Gauge 7
Micro Strain
150
100
50
0
-50
-100
Zero Corrected Strain for Gauge 8
Micro Strain
150
100
50
0
-50
-100
-150
Zero Corrected Strain for Gauge 9
Micro Strain
150
100
50
0
-50
-100
-150
Zero Corrected Strain for Gauge 10
Micro Strain
150
100
50
0
-50
-100
-150
-200
Zero Corrected Strain for Gauge 11
Micro Strain
150
100
50
0
-50
-100
-150
Zero Corrected Strain for Gauge 12
Micro Strain
200
150
100
50
0
-50
-100
-150
Zero Corrected Strain for Gauge 13
Micro Strain
200
100
0
-100
-200
-300
-400
-500
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6


Zero Corrected Strain for Gauge 14
Micro Strain
100
50
0
-50
-100
-150
Zero Corrected Strain for Gauge 15
Micro Strain
150
100
50
0
-50
-100
-150
-200
Zero Corrected Strain for Gauge 16
Micro Strain
200
150
100
50
0
-50
-100
-150
Zero Corrected Strain for Gauge 17
Micro Strain
100
50
0
-50
-100
-150
-200
-250
Zero Corrected Strain for Gauge 18
Micro Strain
150
100
50
0
-50
-100
-150
-200
Zero Corrected Strain for Gauge 19
Micro Strain
250
200
150
100
50
0
-50
-100
Zero Corrected Strain for Gauge 20
Micro Strain
200
150
100
50
0
-50
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6


Zero Corrected Strain for Gauge 21
Micro Strain
250
200
150
100
50
0
-50
Zero Corrected Strain for Gauge 22
Micro Strain
150
100
50
0
-50
-100
-150
-200
Zero Corrected Strain for Gauge 23
Micro Strain
50
0
-50
-100
-150
-200
-250
Zero Corrected Strain for Gauge 24
Micro Strain
100
50
0
-50
-100
-150
-200
-250
Zero Corrected Strain for Gauge 25
Micro Strain
150
100
50
0
-50
-100
-150
-200
Zero Corrected Strain for Gauge 26
Micro Strain
100
50
0
-50
-100
-150
-200
Zero Corrected Strain for Gauge 27
Micro Strain
250
200
150
100
50
0
-50
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6


Zero Corrected Strain for Gauge 28
Micro Strain
50
0
-50
-100
-150
-200
-250
Zero Corrected Strain for Gauge 29
Micro Strain
120
100
80
60
40
20
0
-20
-40
-60
Zero Corrected Strain for Gauge 30
Micro Strain
250
200
150
100
50
0
-50
Zero Corrected Strain for Gauge 31
Micro Strain
50
0
-50
-100
-150
-200
-250
Zero Corrected Strain for Gauge 32
Micro Strain
150
100
50
0
-50
-100
-150
-200
Zero Corrected Strain for Gauge 33
Micro Strain
150
100
50
0
-50
-100
-150
-200
Zero Corrected Strain for Gauge 34
Micro Strain
300
250
200
150
100
50
0
-50
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6

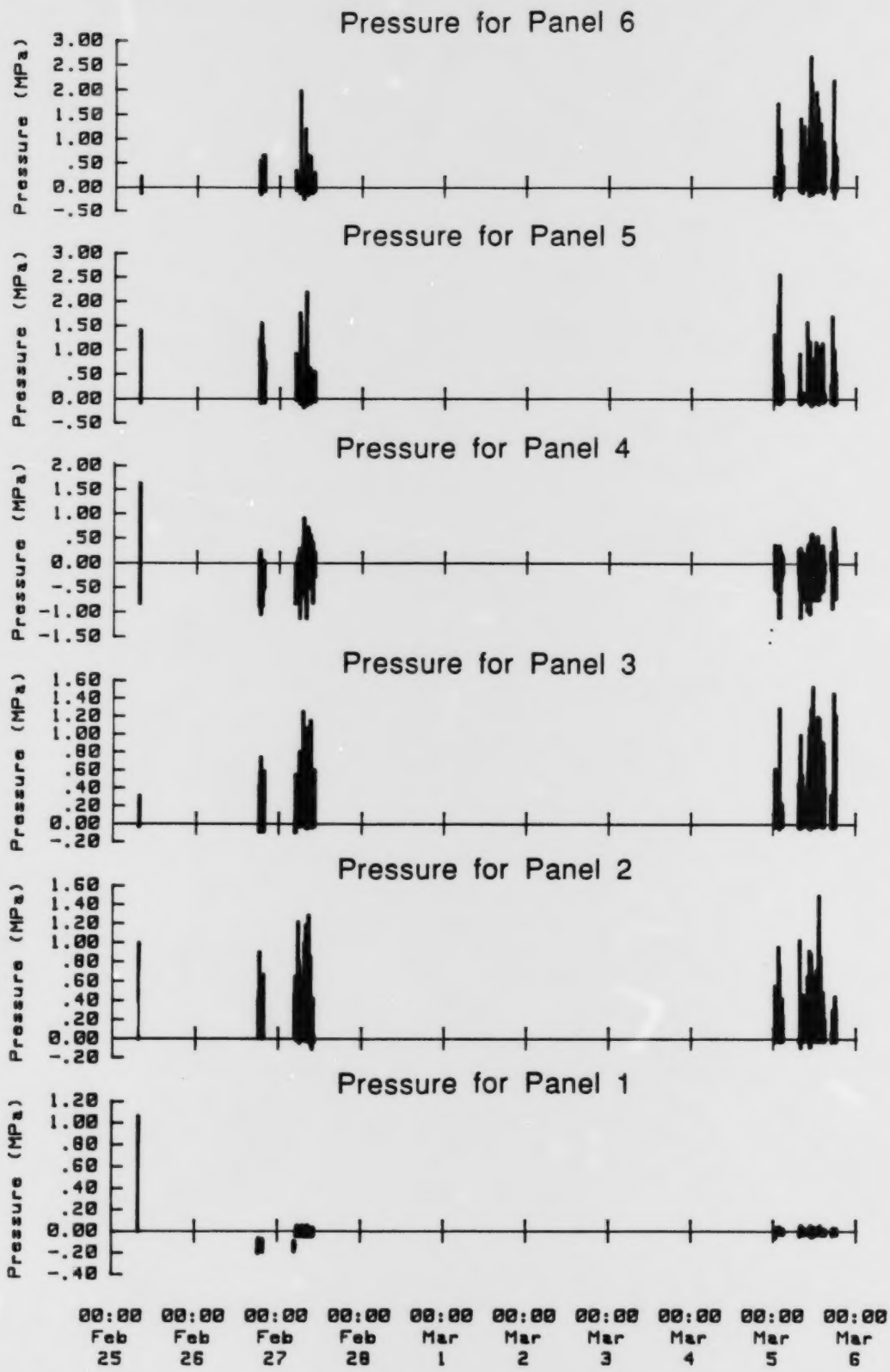

Zero Corrected Strain for Gauge 35
Micro Strain
400
350
300
250
200
150
100
50
0
-50
Zero Corrected Strain for Gauge 36
Micro Strain
300
250
200
150
100
50
0
-50
Zero Corrected Strain for Gauge 37
Micro Strain
350
300
250
200
150
100
50
0
-50
-100
Zero Corrected Strain for Gauge 38
Micro Strain
300
250
200
150
100
50
0
-50
-100
Zero Corrected Strain for Gauge 39
Micro Strain
250
200
150
100
50
0
-50
-100
Zero Corrected Strain for Gauge 40
Micro Strain
250
200
150
100
50
0
-50
-100
-150
Zero Corrected Strain for Gauge 41
Micro Strain
1.50
1.00
.50
0.00
-.50
-1.00
-1.50
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6

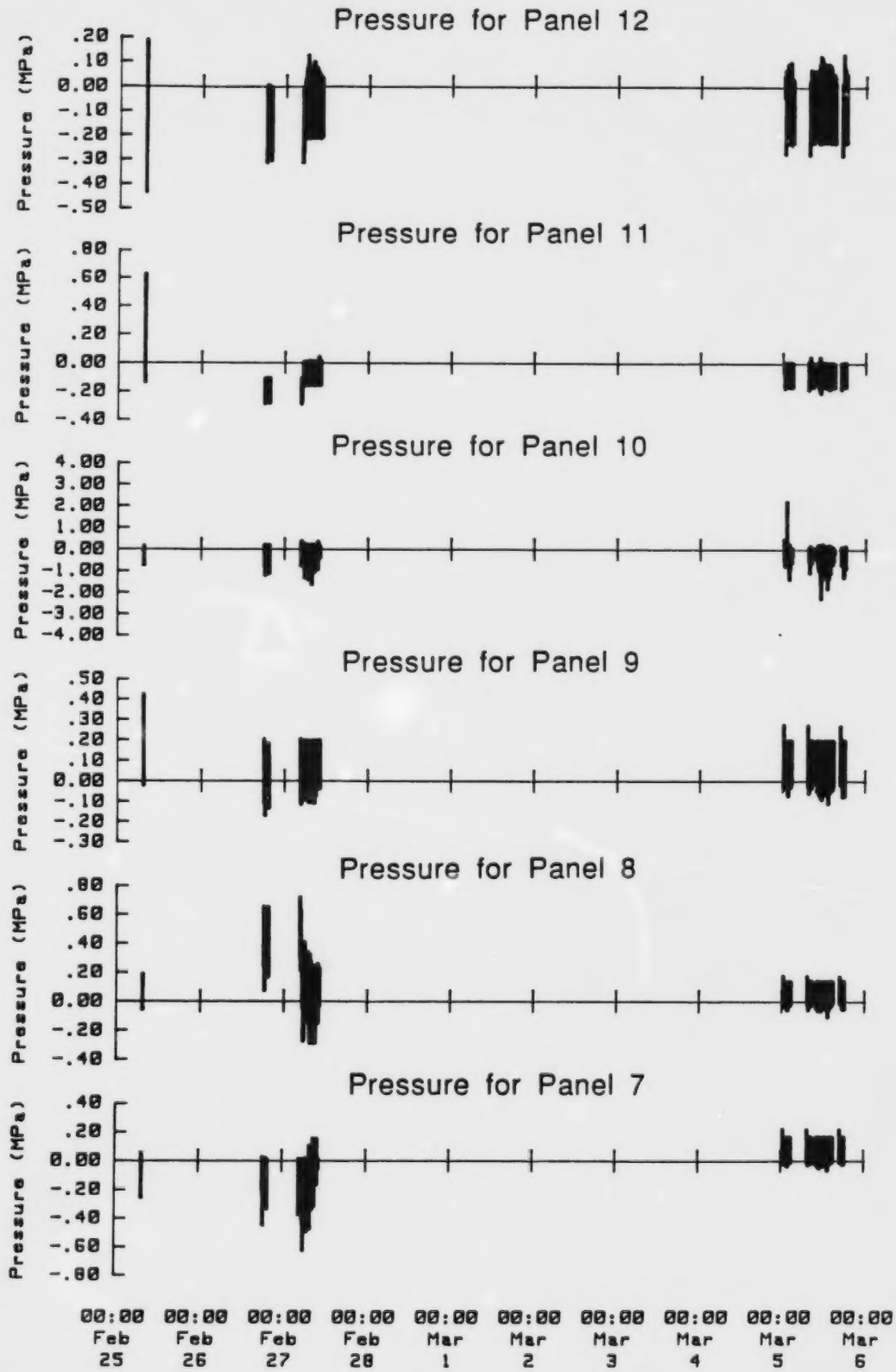

Zero Corrected Strain for Gauge 42
Micro Strain
300
250
200
150
100
50
0
-50
-100
-150
Zero Corrected Strain for Gauge 43
Micro Strain
300
250
200
150
100
50
0
-50
-100
Zero Corrected Strain for Gauge 44
Micro Strain
300
250
200
150
100
50
0
-50
-100
Zero Corrected Strain for Gauge 45
Micro Strain
250
200
150
100
50
0
-50
Zero Corrected Strain for Gauge 46
Micro Strain
300
250
200
150
100
50
0
-50
-100
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6

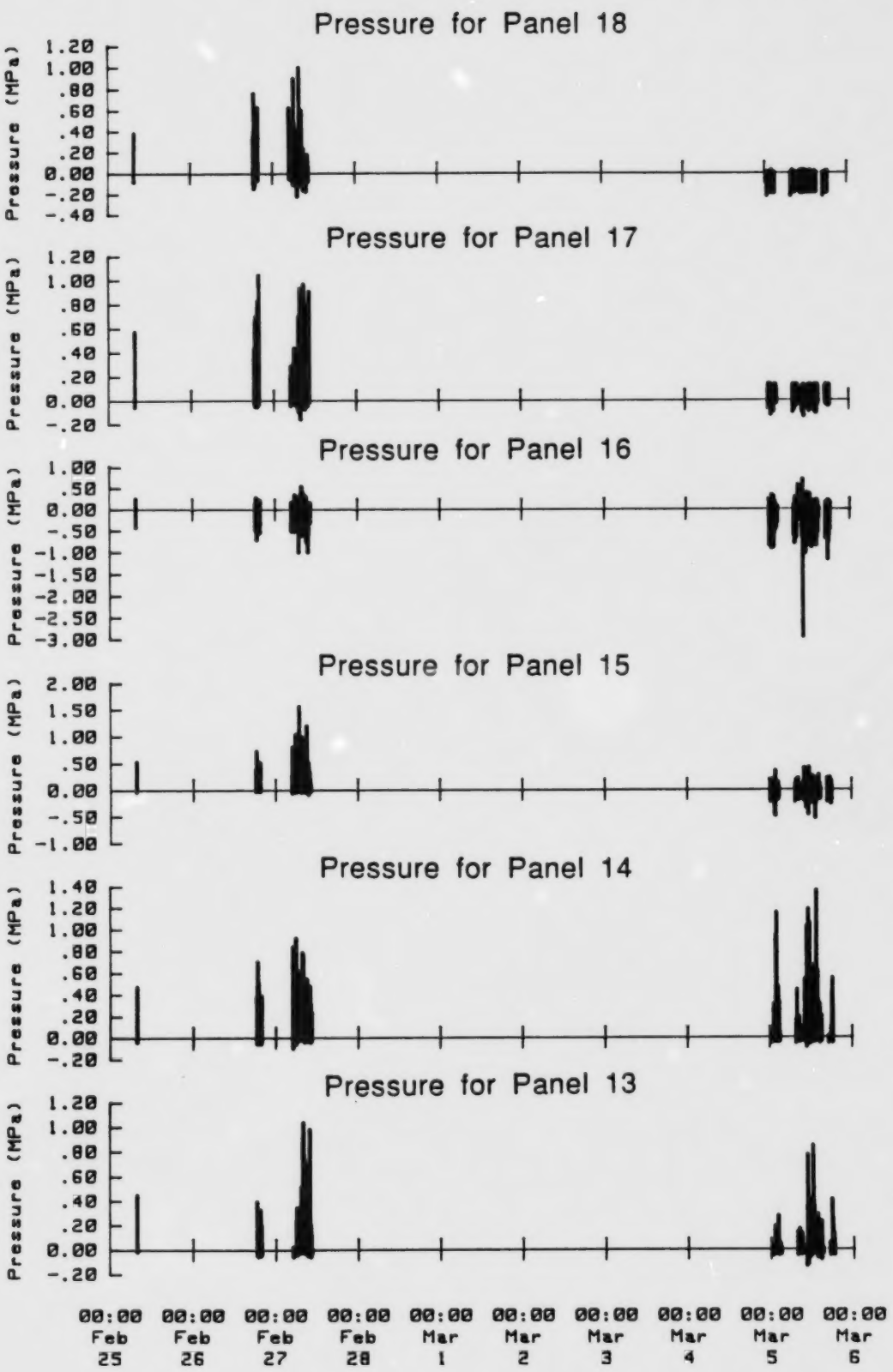
APPENDIX D

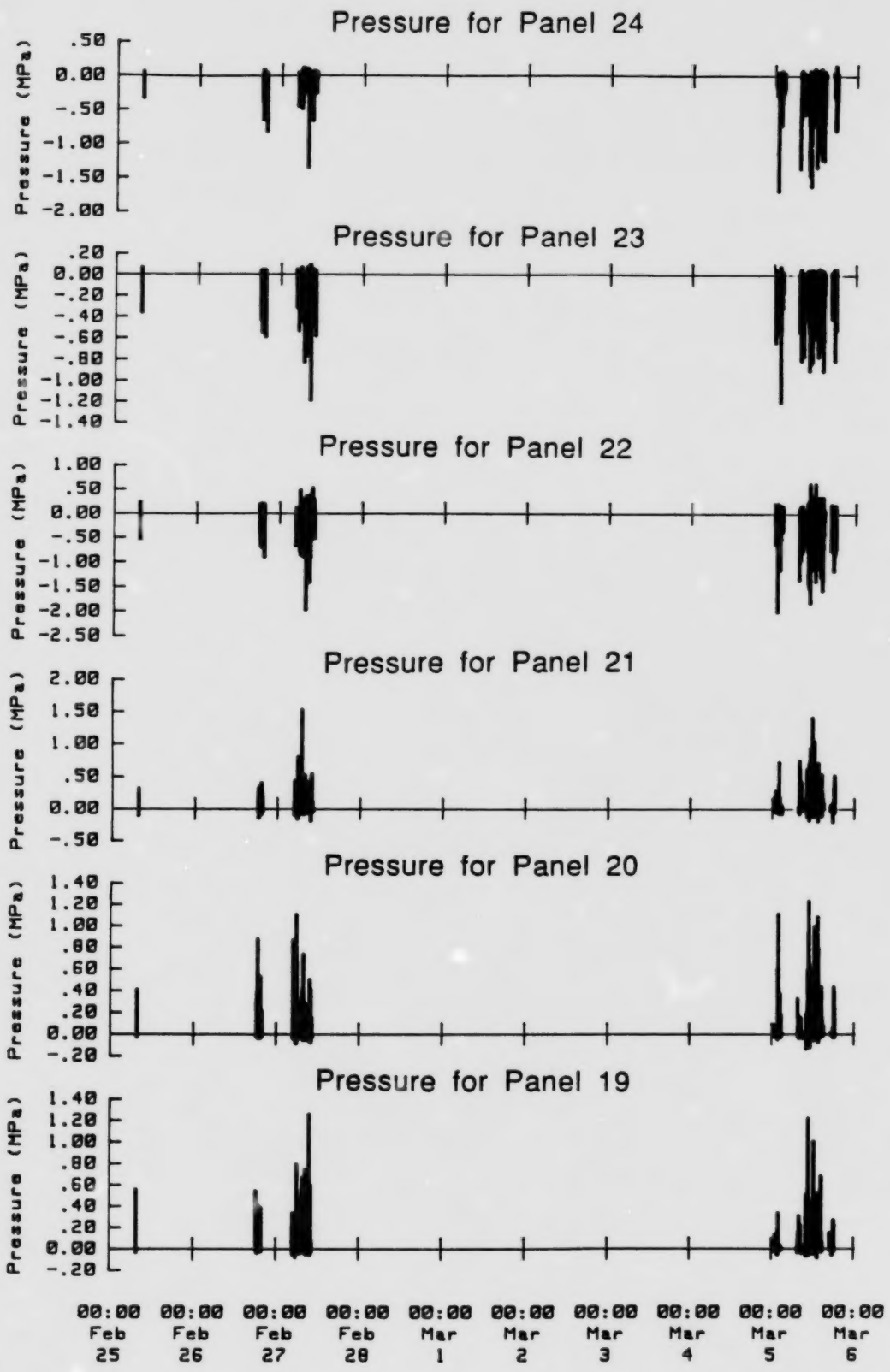
TIME SERIES PLOTS OF THE CALCULATED PANEL PRESSURES

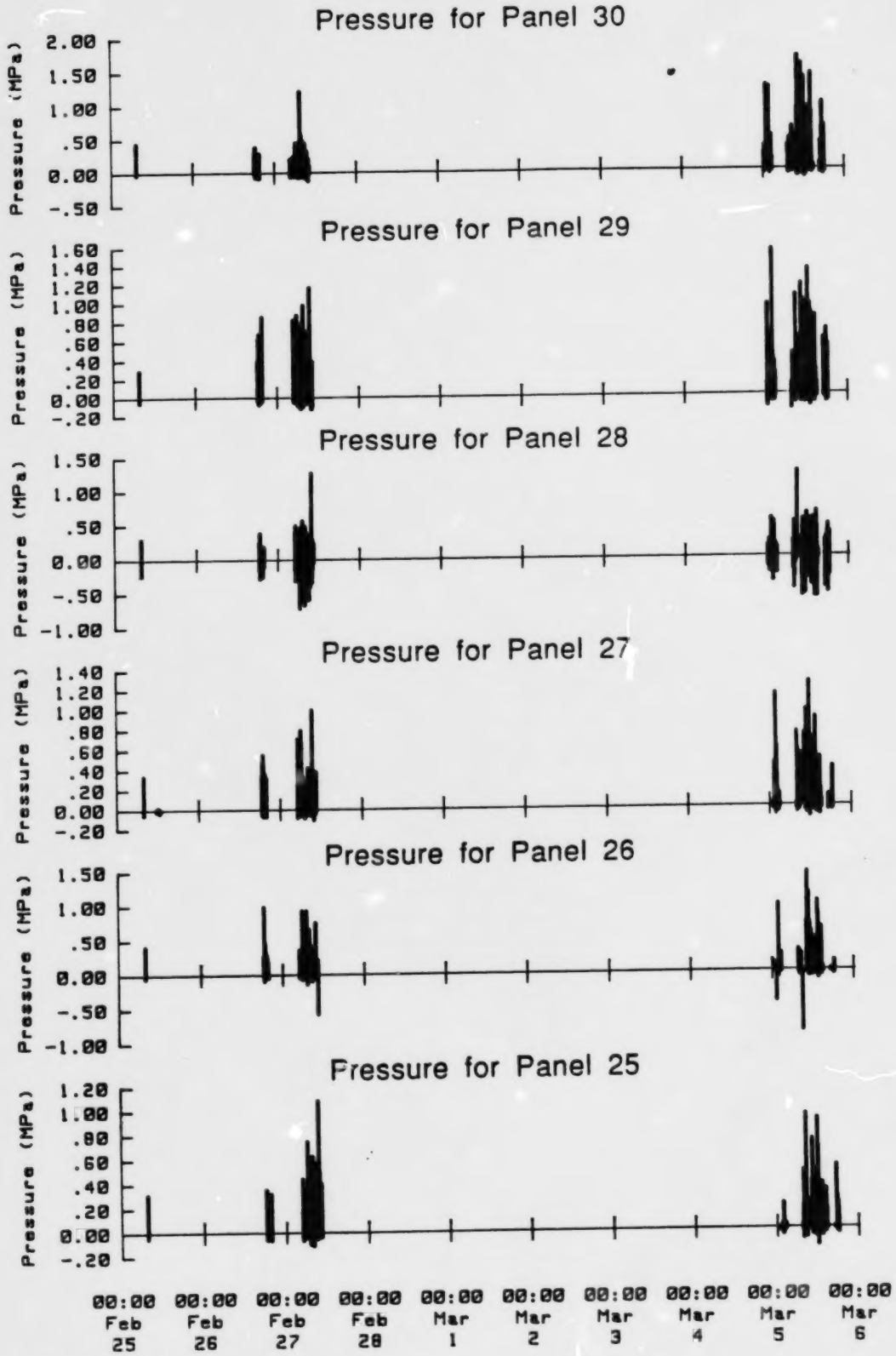
PRESSURE PLOTS
FOR ENTIRE TEST PERIOD

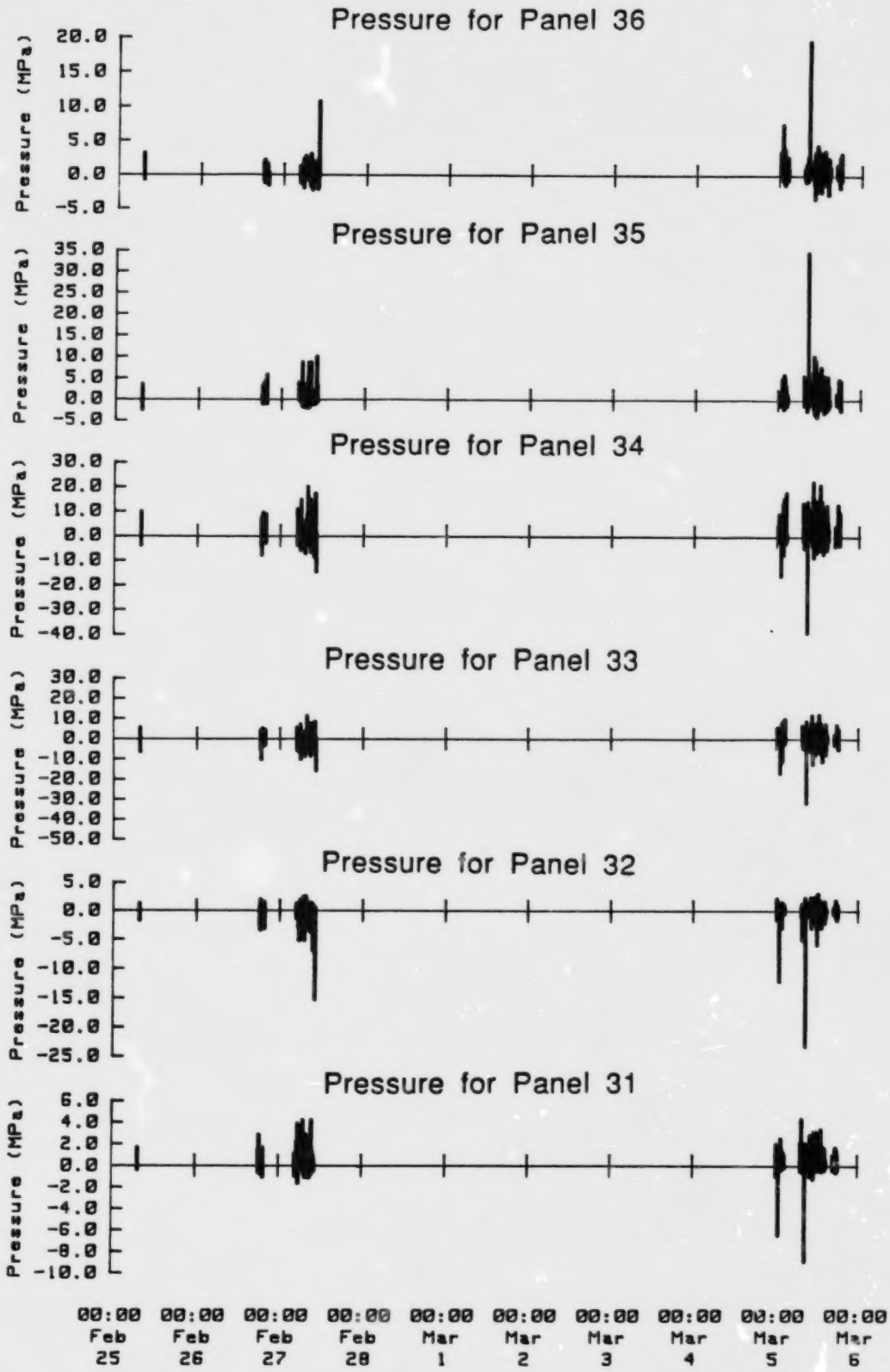

Pressure for Panel 6
Pressure (MPa)
3.00
2.50
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 5
Pressure (MPa)
3.00
2.50
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 4
Pressure (MPa)
2.00
1.50
1.00
.50
0.00
-.50
-1.00
-1.50
Pressure for Panel 3
Pressure (MPa)
1.60
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 2
Pressure (MPa)
1.60
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 1
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
-.40
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6


Pressure for Panel 12
Pressure (MPa)
.20
.10
0.00
-.10
-.20
-.30
-.40
-.50
Pressure for Panel 11
Pressure (MPa)
.80
.60
.40
.20
0.00
-.20
-.40
Pressure for Panel 10
Pressure (MPa)
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
Pressure for Panel 9
Pressure (MPa)
.50
.40
.30
.20
.10
0.00
-.10
-.20
-.30
Pressure for Panel 8
Pressure (MPa)
.80
.60
.40
.20
0.00
-.20
-.40
Pressure for Panel 7
Pressure (MPa)
.40
.20
0.00
-.20
-.40
-.60
-.80
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6

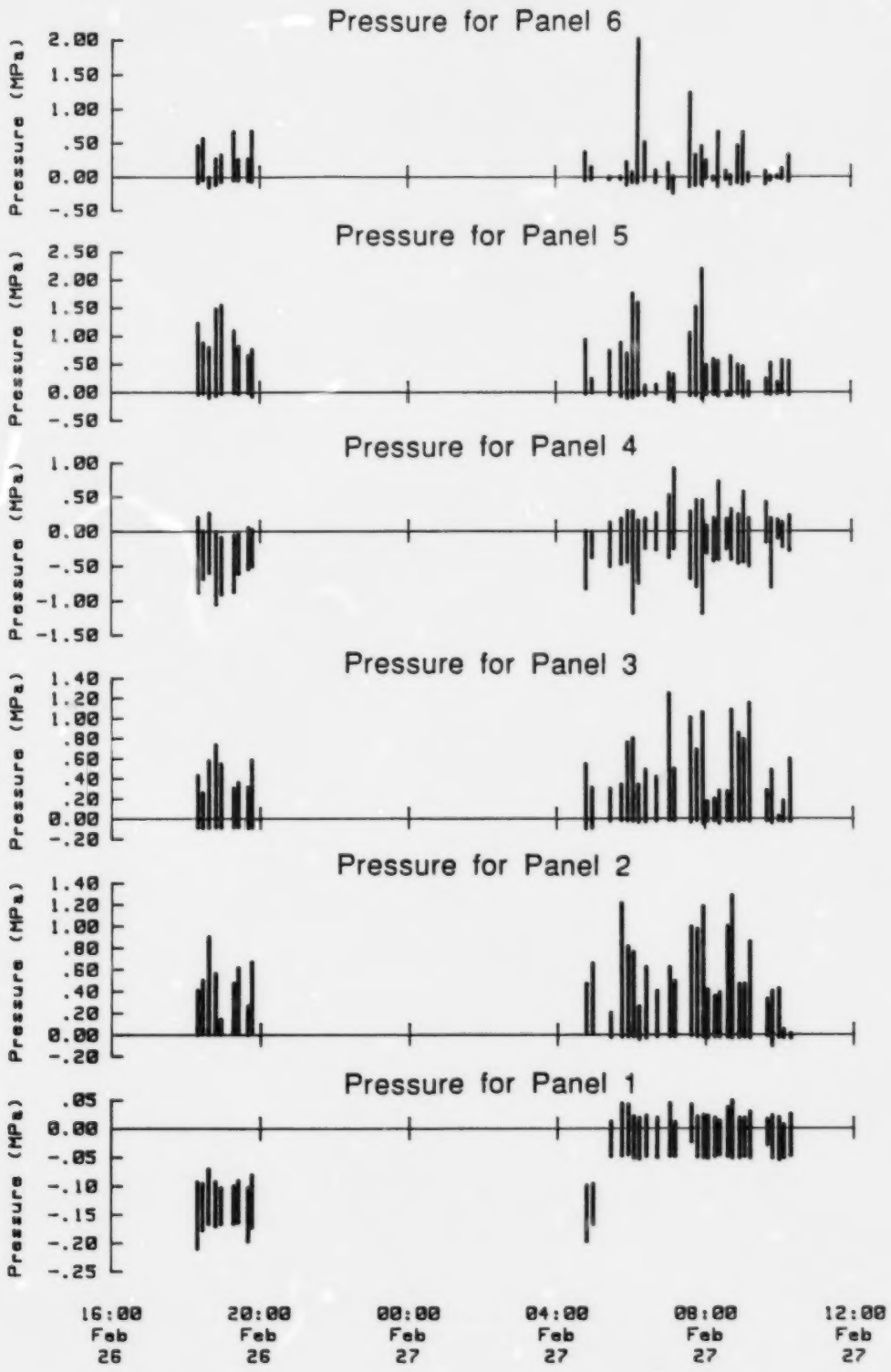

Pressure for Panel 18
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
-.40
Pressure for Panel 17
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 16
Pressure (MPa)
1.00
.50
0.00
-.50
-1.00
-1.50
-2.00
-2.50
-3.00
Pressure for Panel 15
Pressure (MPa)
2.00
1.50
1.00
.50
0.00
-.50
-1.00
Pressure for Panel 14
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 13
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6

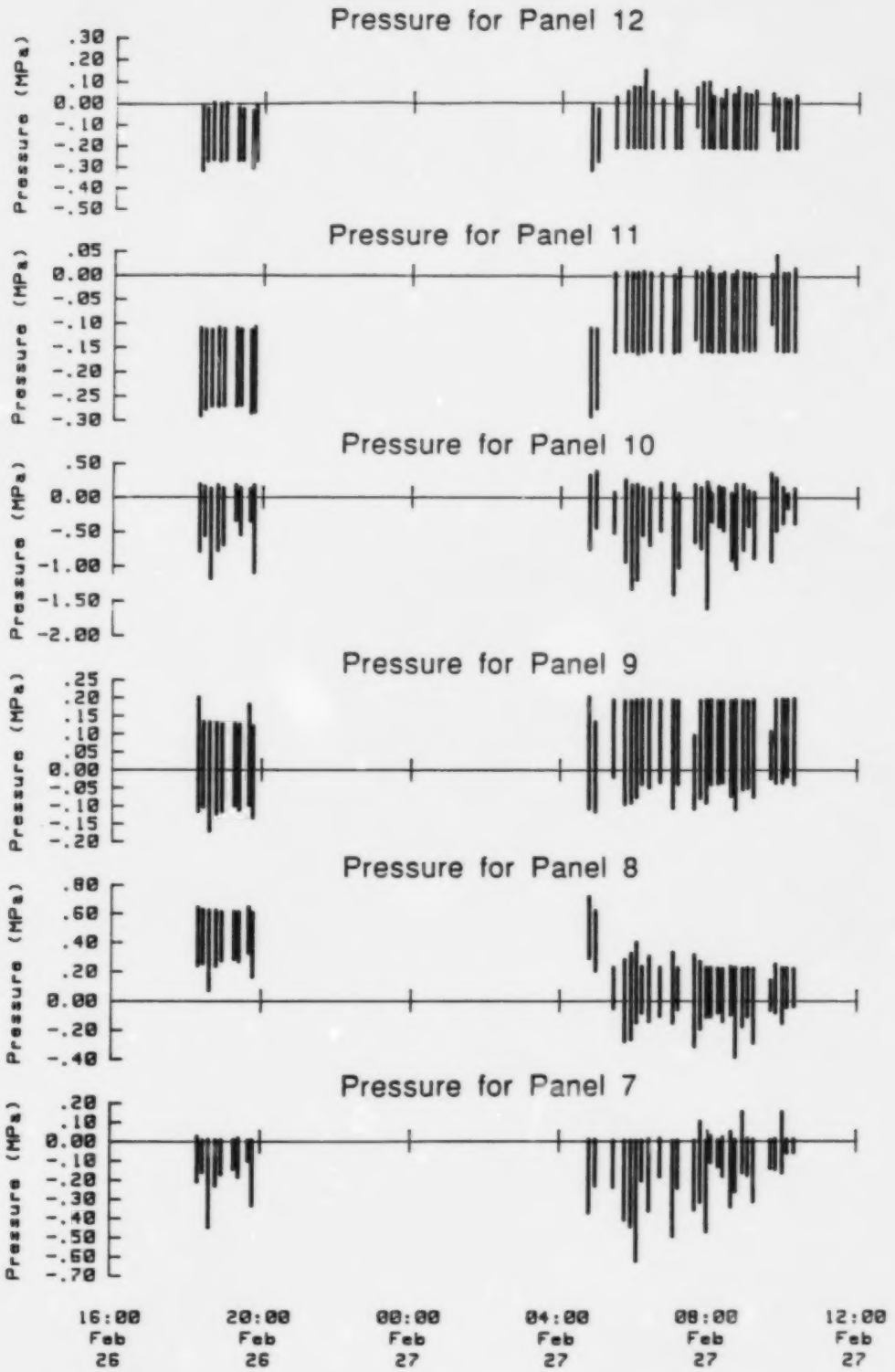

Pressure for Panel 24
Pressure (MPa)
.50
0.00
-.50
-1.00
-1.50
-2.00
Pressure for Panel 23
Pressure (MPa)
.20
0.00
-.20
-.40
-.60
-.80
-1.00
-1.20
-1.40
Pressure for Panel 22
Pressure (MPa)
1.00
.50
0.00
-.50
-1.00
-1.50
-2.00
-2.50
Pressure for Panel 21
Pressure (MPa)
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 20
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 19
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6

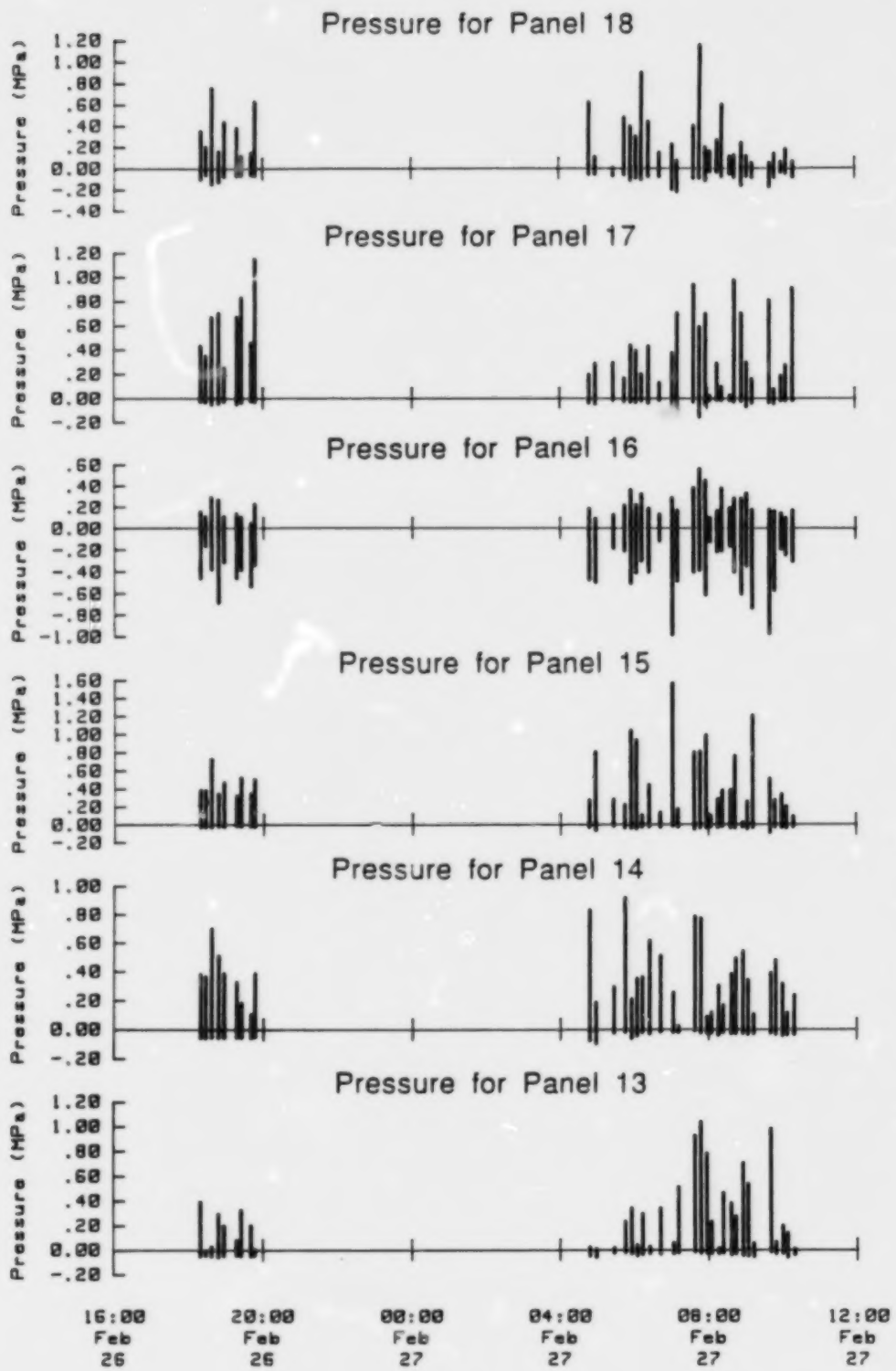

Pressure for Panel 30
Pressure (MPa)
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 29
Pressure (MPa)
1.60
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 28
Pressure (MPa)
1.50
1.00
.50
0.00
-.50
-1.00
Pressure for Panel 27
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 26
Pressure (MPa)
1.50
1.00
.50
0.00
-.50
-1.00
Pressure for Panel 25
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6

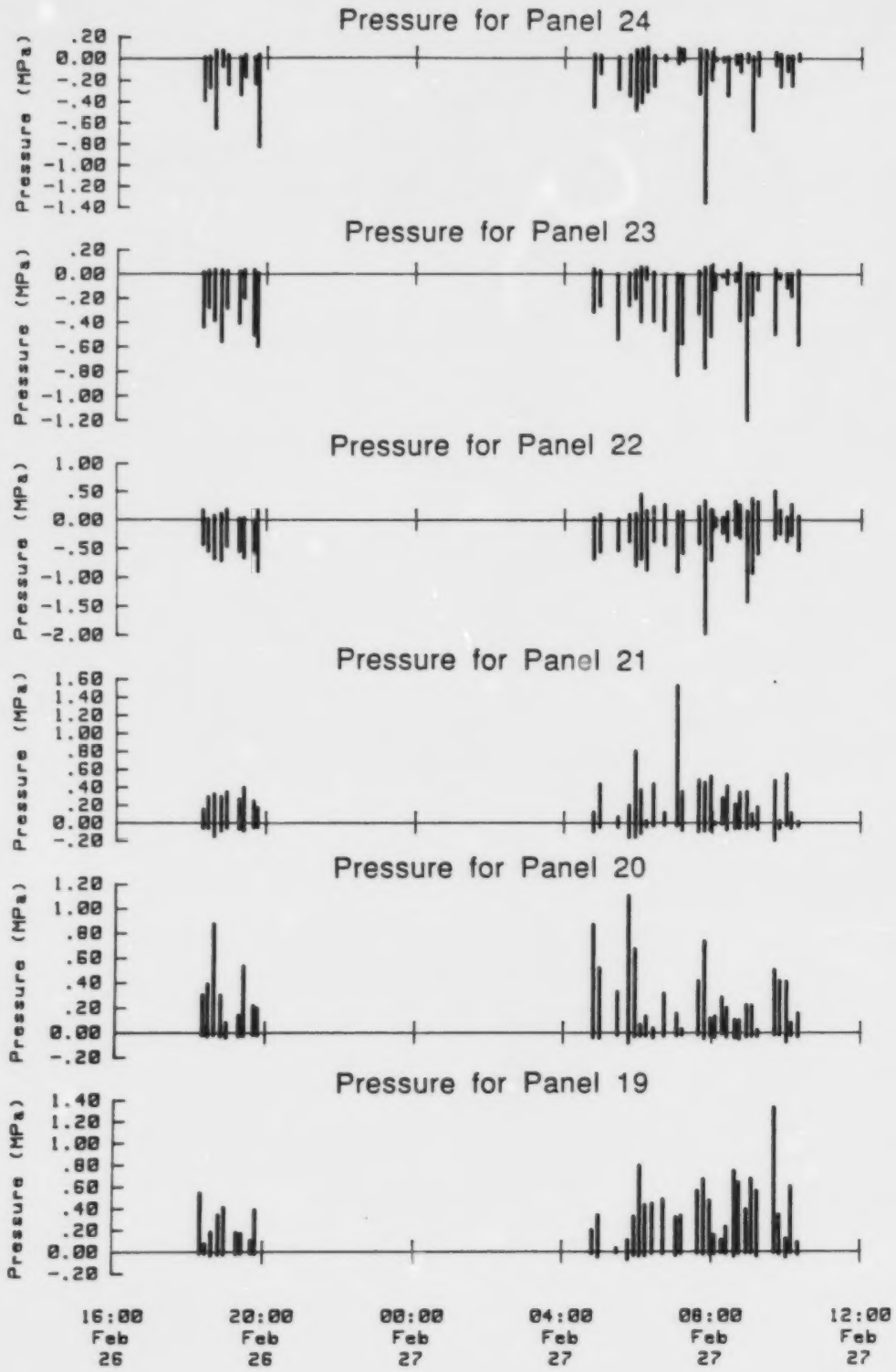

Pressure for Panel 36
Pressure (MPa)
20.0
15.0
10.0
5.0
0.0
-5.0
Pressure for Panel 35
Pressure (MPa)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
Pressure for Panel 34
Pressure (MPa)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
Pressure for Panel 33
Pressure (MPa)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
Pressure for Panel 32
Pressure (MPa)
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
Pressure for Panel 31
Pressure (MPa)
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
00:00 Feb 25
00:00 Feb 26
00:00 Feb 27
00:00 Feb 28
00:00 Mar 1
00:00 Mar 2
00:00 Mar 3
00:00 Mar 4
00:00 Mar 5
00:00 Mar 6

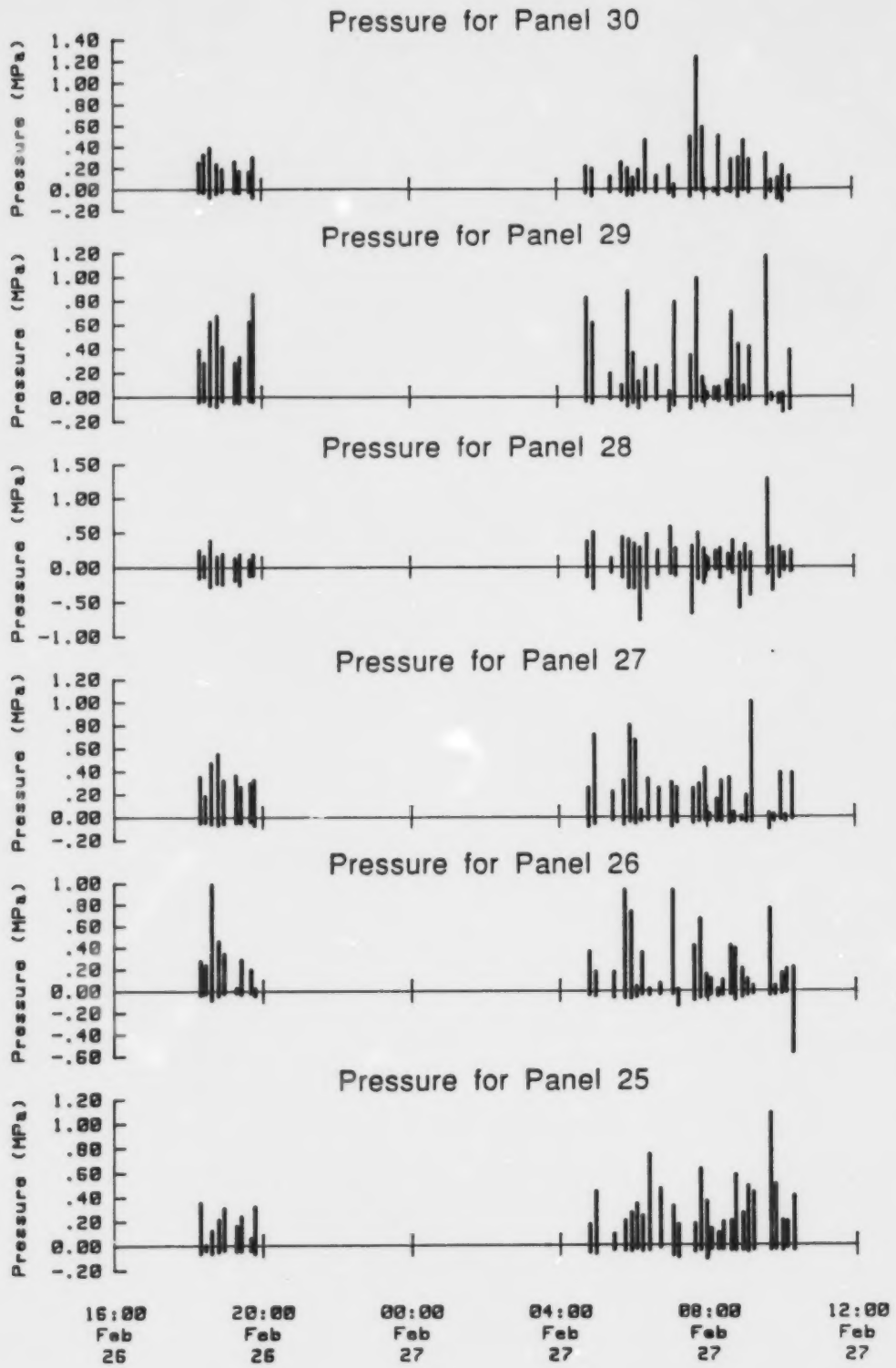
PRESSURE PLOTS
BETWEEN FEBRUARY 26 @ 1600 HRS
AND FEBRUARY 27 @ 1200 HRS

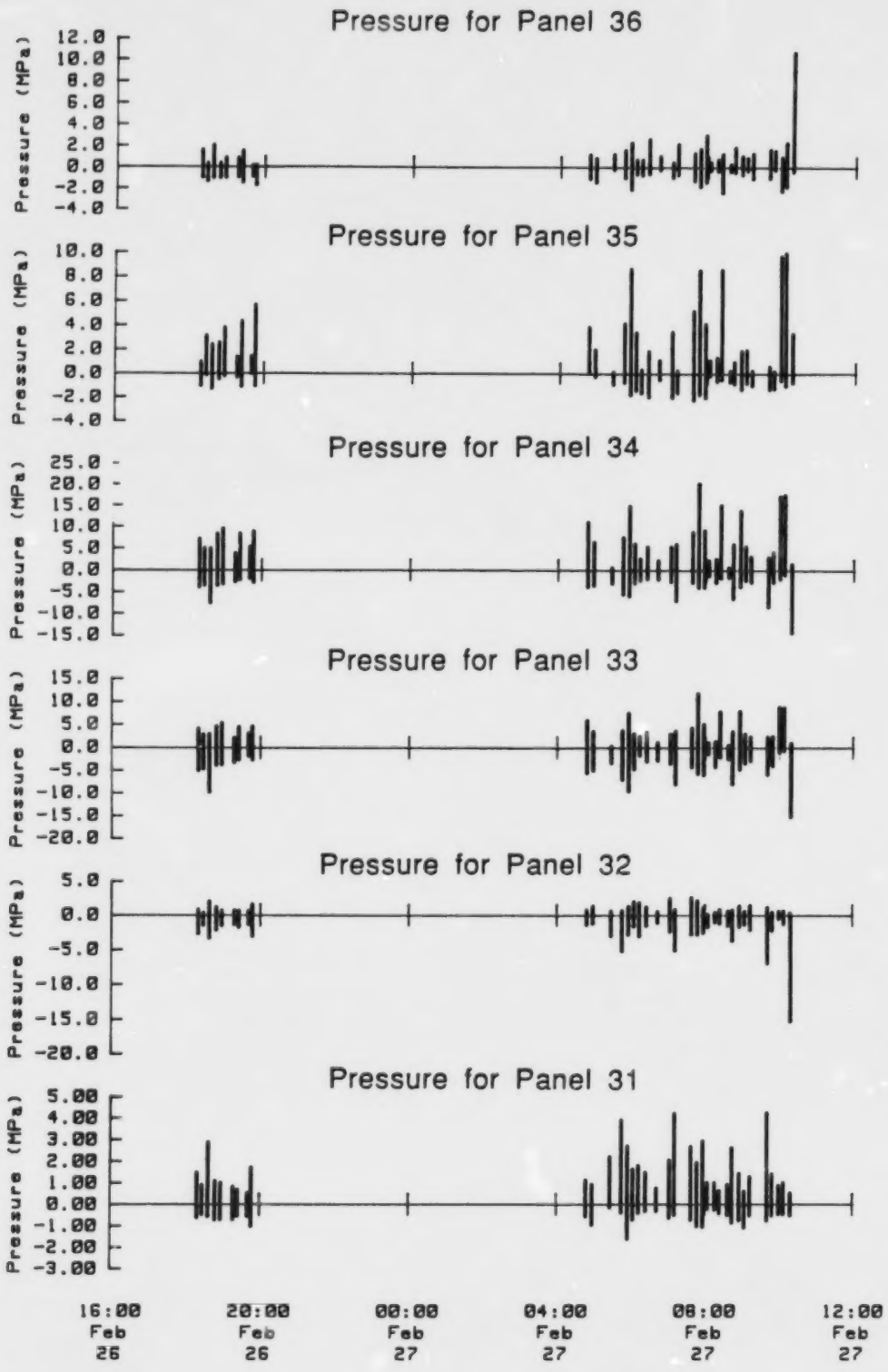

Pressure for Panel 6
Pressure (MPa)
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 5
Pressure (MPa)
2.50
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 4
Pressure (MPa)
1.00
.50
0.00
-.50
-1.00
-1.50
Pressure for Panel 3
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 2
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 1
Pressure (MPa)
.05
0.00
-.05
-.10
-.15
-.20
-.25
16:00 Feb 26
20:00 Feb 26
00:00 Feb 27
04:00 Feb 27
08:00 Feb 27
12:00 Feb 27


Pressure for Panel 12
Pressure (MPa)
.30
.20
.10
0.00
-.10
-.20
-.30
-.40
-.50
Pressure for Panel 11
Pressure (MPa)
.05
0.00
-.05
-.10
-.15
-.20
-.25
-.30
Pressure for Panel 10
Pressure (MPa)
.50
0.00
-.50
-1.00
-1.50
-2.00
Pressure for Panel 9
Pressure (MPa)
.25
.20
.15
.10
.05
0.00
-.05
-.10
-.15
-.20
Pressure for Panel 8
Pressure (MPa)
.80
.60
.40
.20
0.00
-.20
-.40
Pressure for Panel 7
Pressure (MPa)
.20
.10
0.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
16:00 Feb 26
20:00 Feb 26
00:00 Feb 27
04:00 Feb 27
08:00 Feb 27
12:00 Feb 27

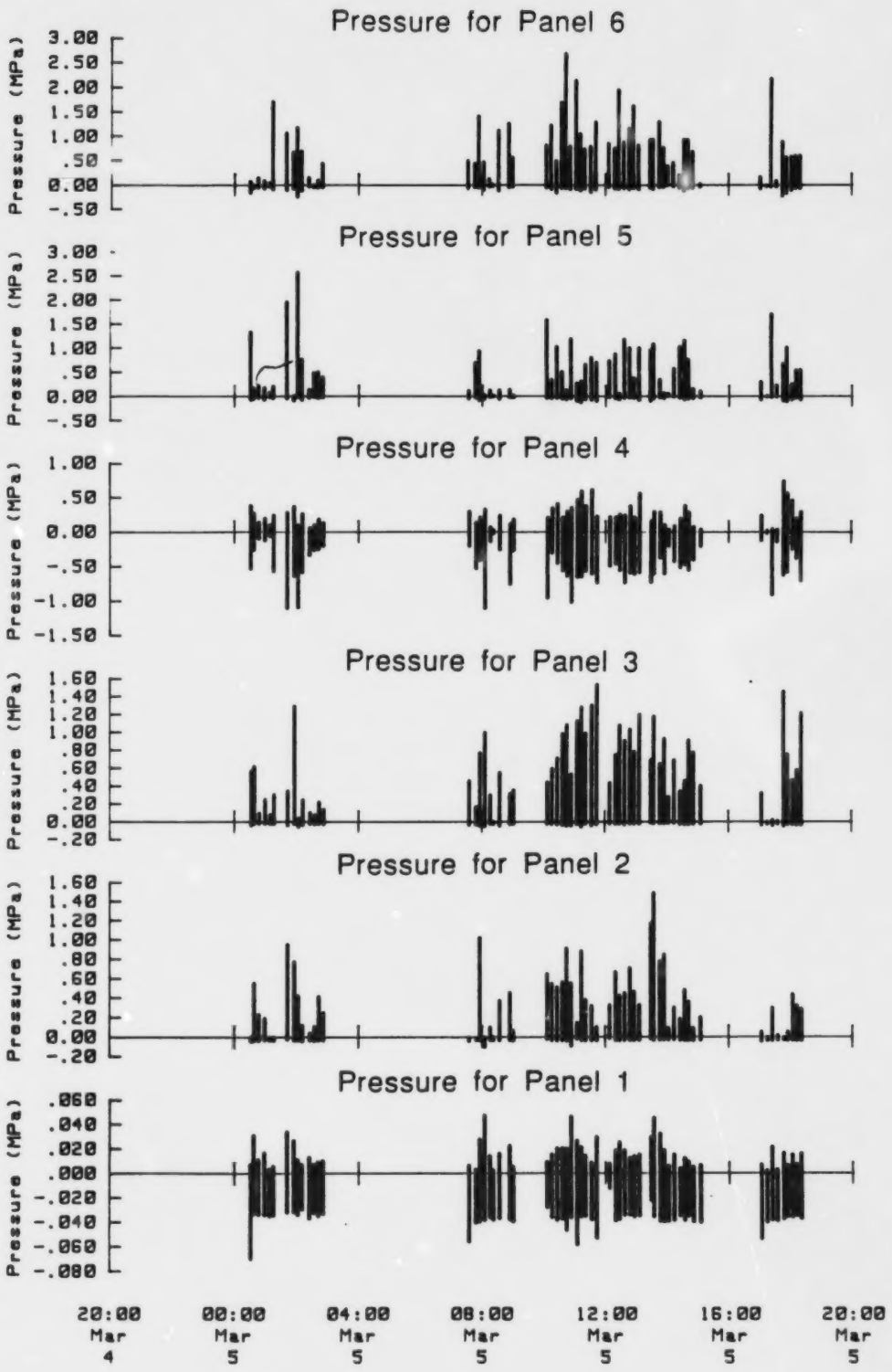

Pressure for Panel 18
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
-.40
Pressure for Panel 17
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 16
Pressure (MPa)
.60
.40
.20
0.00
-.20
-.40
-.60
-.80
-1.00
Pressure for Panel 15
Pressure (MPa)
1.60
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 14
Pressure (MPa)
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 13
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
16:00 Feb 26
20:00 Feb 26
00:00 Feb 27
04:00 Feb 27
08:00 Feb 27
12:00 Feb 27

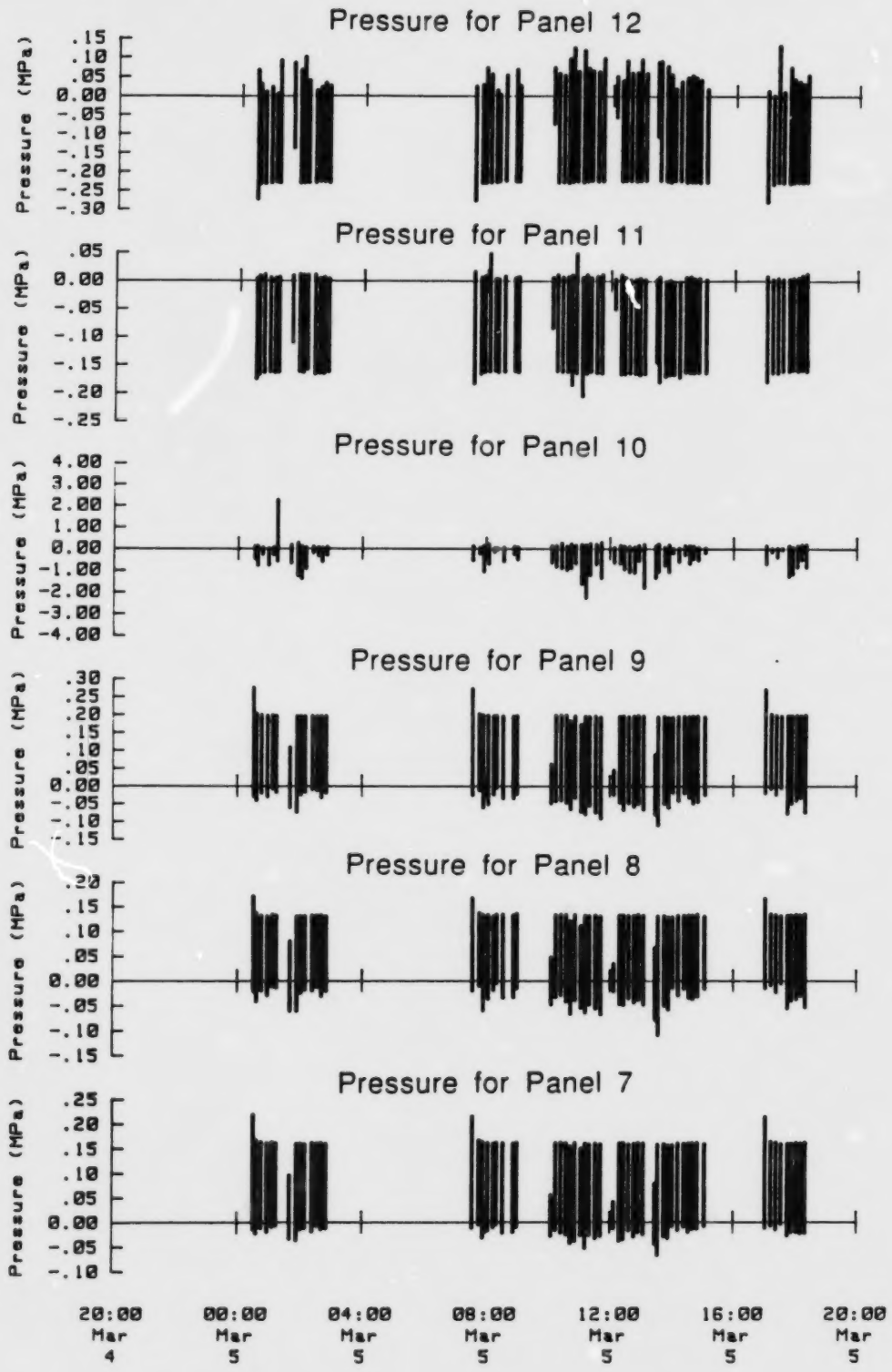

Pressure for Panel 24
Pressure (MPa)
.20
0.00
-.20
-.40
-.60
-.80
-1.00
-1.20
-1.40
Pressure for Panel 23
Pressure (MPa)
.20
0.00
-.20
-.40
-.60
-.80
-1.00
-1.20
Pressure for Panel 22
Pressure (MPa)
1.00
.50
0.00
-.50
-1.00
-1.50
-2.00
Pressure for Panel 21
Pressure (MPa)
1.60
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 20
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 19
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
16:00 Feb 26
20:00 Feb 26
00:00 Feb 27
04:00 Feb 27
08:00 Feb 27
12:00 Feb 27

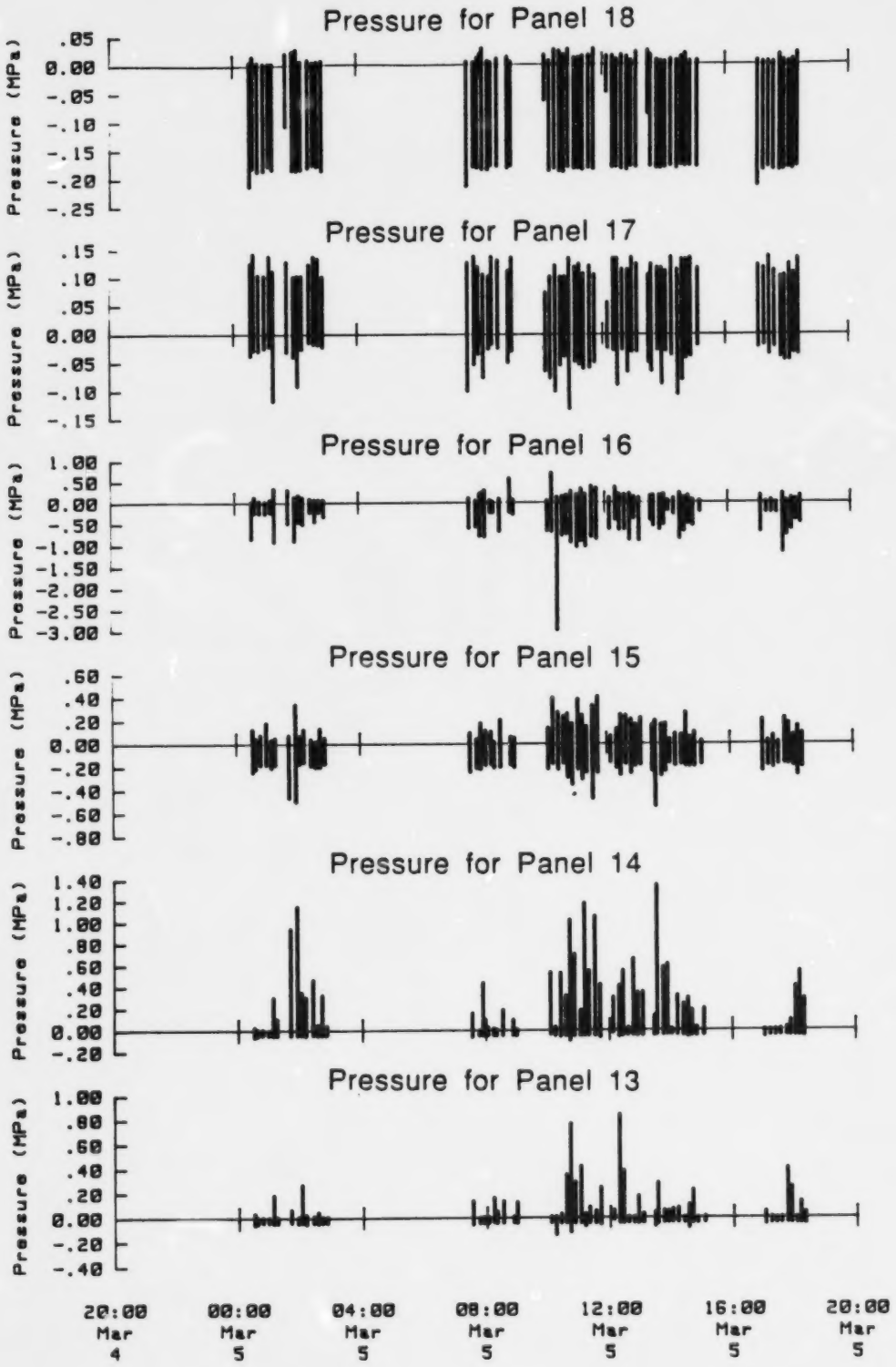

Pressure for Panel 30
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 29
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 28
Pressure (MPa)
1.50
1.00
.50
0.00
-.50
-1.00
Pressure for Panel 27
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 26
Pressure (MPa)
1.00
.80
.60
.40
.20
0.00
-.20
-.40
-.60
Pressure for Panel 25
Pressure (MPa)
1.20
1.00
.80
.60
.40
.20
0.00
-.20
16:00 Feb 26
20:00 Feb 26
00:00 Feb 27
04:00 Feb 27
08:00 Feb 27
12:00 Feb 27

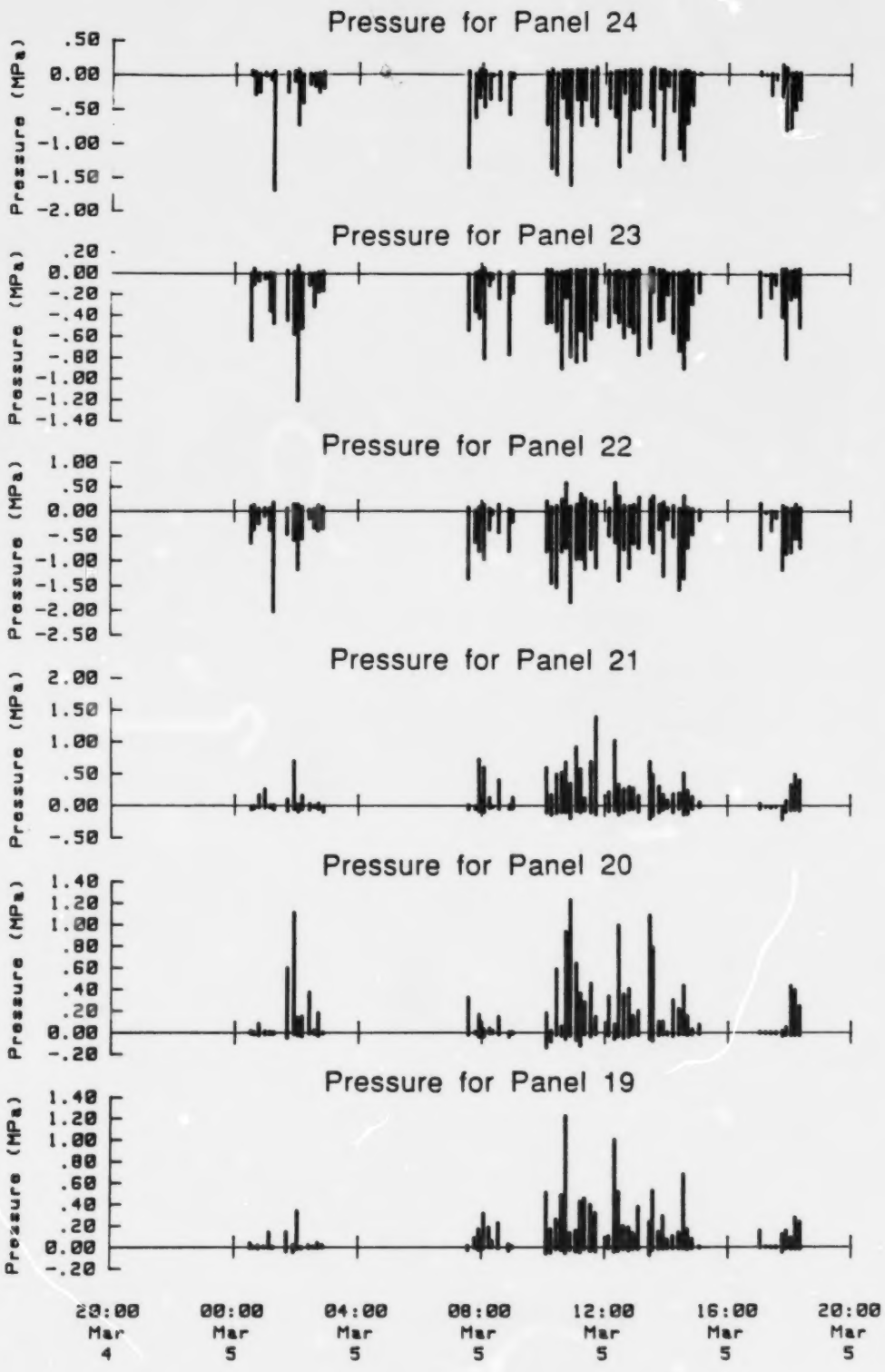

Pressure for Panel 36
Pressure (MPa)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
Pressure for Panel 35
Pressure (MPa)
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
Pressure for Panel 34
Pressure (MPa)
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
Pressure for Panel 33
Pressure (MPa)
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
Pressure for Panel 32
Pressure (MPa)
5.0
0.0
-5.0
-10.0
-15.0
-20.0
Pressure for Panel 31
Pressure (MPa)
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
16:00 Feb 26
20:00 Feb 26
00:00 Feb 27
04:00 Feb 27
08:00 Feb 27
12:00 Feb 27

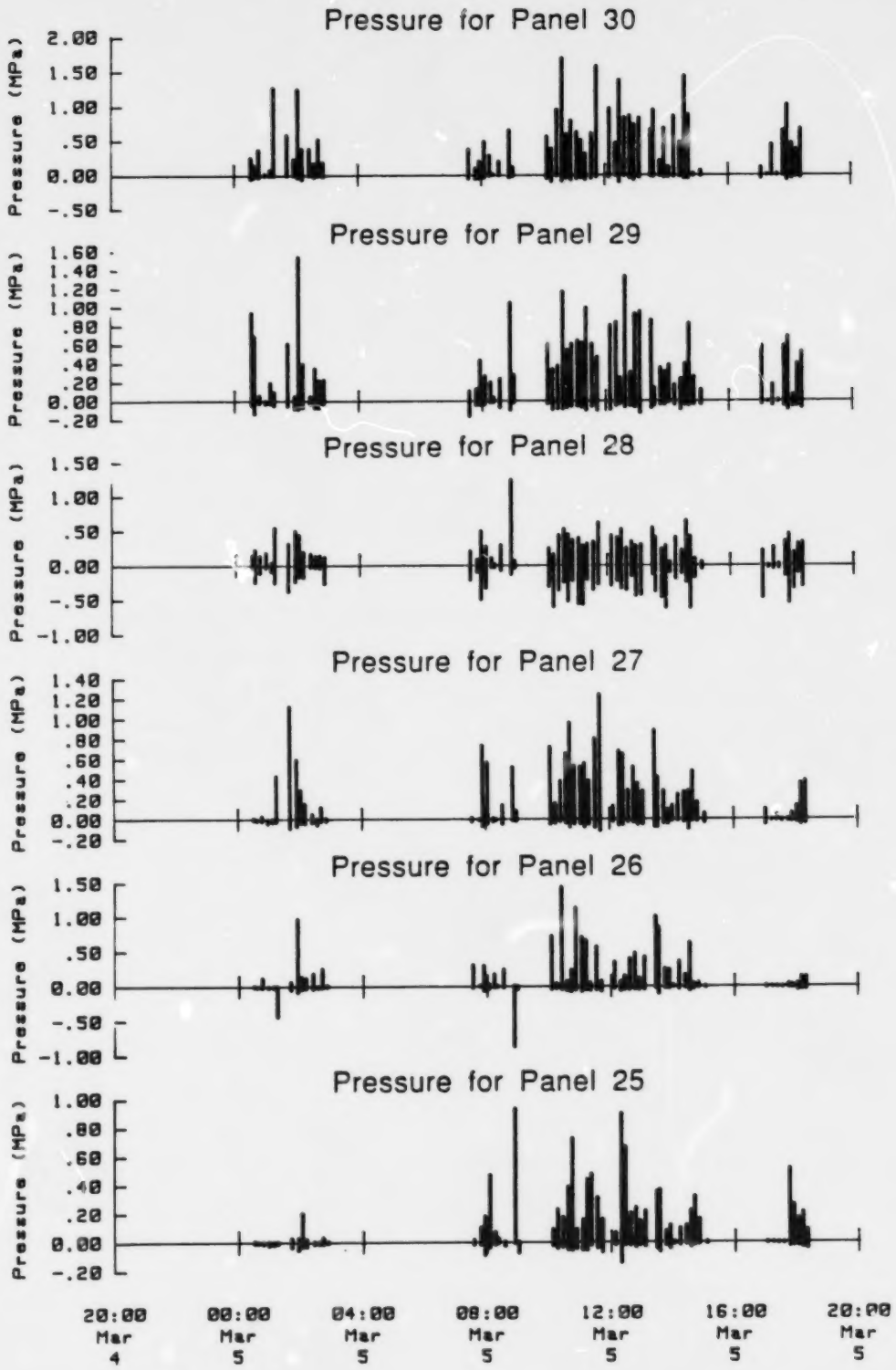
PRESSURE PLOTS
BETWEEN MARCH 4 @ 2000 HRS
AND MARCH 5 @ 2000 HRS

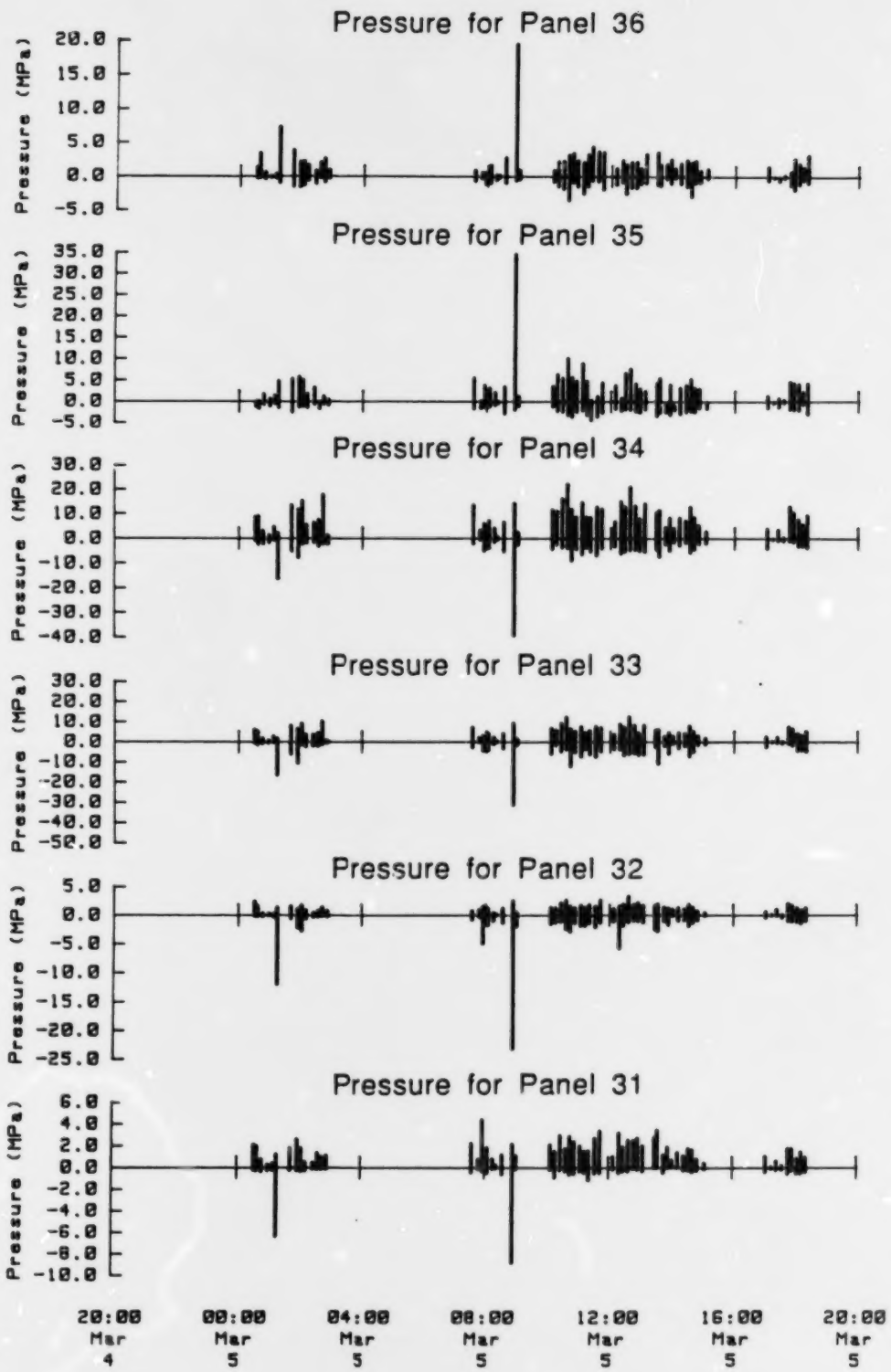

Pressure for Panel 6
Pressure (MPa)
3.00
2.50
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 5
Pressure (MPa)
3.00
2.50
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 4
Pressure (MPa)
1.00
.50
0.00
-.50
-1.00
-1.50
Pressure for Panel 3
Pressure (MPa)
1.60
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 2
Pressure (MPa)
1.60
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 1
Pressure (MPa)
.060
.040
.020
.000
-.020
-.040
-.060
-.080
20:00 Mar 4
00:00 Mar 5
04:00 Mar 5
08:00 Mar 5
12:00 Mar 5
16:00 Mar 5
20:00 Mar 5


Pressure for Panel 12
Pressure (MPa)
.15
.10
.05
0.00
-.05
-.10
-.15
-.20
-.25
-.30
Pressure for Panel 11
Pressure (MPa)
.05
0.00
-.05
-.10
-.15
-.20
-.25
Pressure for Panel 10
Pressure (MPa)
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
Pressure for Panel 9
Pressure (MPa)
.30
.25
.20
.15
.10
.05
0.00
-.05
-.10
-.15
Pressure for Panel 8
Pressure (MPa)
.20
.15
.10
.05
0.00
-.05
-.10
-.15
Pressure for Panel 7
Pressure (MPa)
.25
.20
.15
.10
.05
0.00
-.05
-.10
20:00 Mar 4
00:00 Mar 5
04:00 Mar 5
08:00 Mar 5
12:00 Mar 5
16:00 Mar 5
20:00 Mar 5


Pressure for Panel 18
Pressure (MPa)
.05
0.00
-.05
-.10
-.15
-.20
-.25
Pressure for Panel 17
Pressure (MPa)
.15
.10
.05
0.00
-.05
-.10
-.15
Pressure for Panel 16
Pressure (MPa)
1.00
.50
0.00
-.50
-1.00
-1.50
-2.00
-2.50
-3.00
Pressure for Panel 15
Pressure (MPa)
.60
.40
.20
0.00
-.20
-.40
-.60
-.80
Pressure for Panel 14
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 13
Pressure (MPa)
1.00
.80
.60
.40
.20
0.00
-.20
-.40
20:00 Mar 4
00:00 Mar 5
04:00 Mar 5
08:00 Mar 5
12:00 Mar 5
16:00 Mar 5
20:00 Mar 5


Pressure for Panel 24
Pressure (MPa)
.50
0.00
-.50
-1.00
-1.50
-2.00
Pressure for Panel 23
Pressure (MPa)
.20
0.00
-.20
-.40
-.60
-.80
-1.00
-1.20
-1.40
Pressure for Panel 22
Pressure (MPa)
1.00
.50
0.00
-.50
-1.00
-1.50
-2.00
-2.50
Pressure for Panel 21
Pressure (MPa)
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 20
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 19
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
20:00 Mar 4
00:00 Mar 5
04:00 Mar 5
08:00 Mar 5
12:00 Mar 5
16:00 Mar 5
20:00 Mar 5


Pressure for Panel 30
Pressure (MPa)
2.00
1.50
1.00
.50
0.00
-.50
Pressure for Panel 29
Pressure (MPa)
1.60
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 28
Pressure (MPa)
1.50
1.00
.50
0.00
-.50
-1.00
Pressure for Panel 27
Pressure (MPa)
1.40
1.20
1.00
.80
.60
.40
.20
0.00
-.20
Pressure for Panel 26
Pressure (MPa)
1.50
1.00
.50
0.00
-.50
-1.00
Pressure for Panel 25
Pressure (MPa)
1.00
.80
.60
.40
.20
0.00
-.20
20:00 Mar 4
00:00 Mar 5
04:00 Mar 5
08:00 Mar 5
12:00 Mar 5
16:00 Mar 5
20:00 Mar 5


Pressure for Panel 36
Pressure (MPa)
20.0
15.0
10.0
5.0
0.0
-5.0
Pressure for Panel 35
Pressure (MPa)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
Pressure for Panel 34
Pressure (MPa)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
Pressure for Panel 33
Pressure (MPa)
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
Pressure for Panel 32
Pressure (MPa)
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
Pressure for Panel 31
Pressure (MPa)
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
20:00 Mar 4
00:00 Mar 5
04:00 Mar 5
08:00 Mar 5
12:00 Mar 5
16:00 Mar 5
20:00 Mar 5

APPENDIX E

PRESSURE STATISTICS

PRESSURE STATISTICS
ON ALL 'GOOD' PANELS WITH EACH
PANEL TAKEN SEPARATELY
(RANKING THE PEAK VALUE FOR
EACH 8 MINUTE WINDOW)

All Panels have been taken as an individual event

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.250	721	46.0
2	.250	.500	432	27.6
3	.500	.750	194	12.4
4	.750	1.000	107	6.8
5	1.000	1.250	59	3.8
6	1.250	1.500	23	1.5
7	1.500	1.750	14	.9
8	1.750	2.000	4	.3
9	2.000	2.250	3	.2
10	2.250	2.500	0	0.0
11	2.500	2.750	2	.1
Total			1559	99.4

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	5 Mar 1987	10:46:48.48	2.668	2	5 Mar 1987	02:06:48.61	2.567
3	27 Feb 1987	08:00:50.21	2.202	4	5 Mar 1987	17:24:44.70	2.179
5	5 Mar 1987	11:05:46.13	2.137	6	27 Feb 1987	06:15:25.58	1.989
7	5 Mar 1987	01:47:21.46	1.951	8	5 Mar 1987	12:27:39.57	1.950
9	27 Feb 1987	06:03:08.36	1.773	10	5 Mar 1987	01:14:30.54	1.717
11	5 Mar 1987	17:24:44.61	1.704	12	5 Mar 1987	10:38:56.16	1.688
13	5 Mar 1987	10:36:45.82	1.682	14	25 Feb 1987	07:28:54.11	1.644
15	5 Mar 1987	12:59:19.24	1.627	16	27 Feb 1987	06:15:25.67	1.605
17	5 Mar 1987	10:10:01.00	1.587	18	5 Mar 1987	11:40:24.63	1.573
19	26 Feb 1987	18:58:03.59	1.554	20	5 Mar 1987	02:01:08.85	1.541
21	5 Mar 1987	11:45:19.89	1.533	22	27 Feb 1987	07:43:50.96	1.531
23	27 Feb 1987	07:02:51.71	1.521	24	5 Mar 1987	13:33:27.35	1.492
25	26 Feb 1987	18:51:30.20	1.489	26	5 Mar 1987	17:47:40.72	1.458
27	5 Mar 1987	10:27:21.46	1.435	28	5 Mar 1987	14:35:36.19	1.433
29	25 Feb 1987	07:27:56.82	1.419	30	5 Mar 1987	07:53:52.32	1.404
31	5 Mar 1987	11:45:19.62	1.403	32	5 Mar 1987	12:26:35.30	1.372
33	5 Mar 1987	13:33:27.14	1.350	34	5 Mar 1987	00:32:36.67	1.336
35	5 Mar 1987	12:38:57.36	1.334	36	27 Feb 1987	09:39:27.82	1.334
37	5 Mar 1987	11:29:56.19	1.306	38	5 Mar 1987	13:48:25.89	1.299
39	5 Mar 1987	11:43:32.88	1.295	40	5 Mar 1987	01:55:13.30	1.293
41	5 Mar 1987	11:10:59.46	1.283	42	27 Feb 1987	08:40:49.68	1.282
43	27 Feb 1987	09:39:27.79	1.273	44	5 Mar 1987	01:13:17.84	1.259
45	27 Feb 1987	07:02:51.78	1.254	46	5 Mar 1987	08:52:27.67	1.252
47	5 Mar 1987	08:52:27.74	1.247	48	5 Mar 1987	11:45:19.59	1.246
49	26 Feb 1987	18:20:45.60	1.236	50	5 Mar 1987	02:03:30.85	1.236
51	5 Mar 1987	10:51:05.99	1.234	52	27 Feb 1987	07:50:55.07	1.230
53	5 Mar 1987	10:44:41.96	1.222	54	5 Mar 1987	18:18:37.36	1.219
55	5 Mar 1987	10:18:18.03	1.215	56	27 Feb 1987	07:38:34.84	1.214
57	27 Feb 1987	05:45:22.27	1.213	58	5 Mar 1987	13:06:23.53	1.200
59	5 Mar 1987	10:58:04.81	1.190	60	27 Feb 1987	07:58:01.47	1.181
61	5 Mar 1987	02:01:10.11	1.180	62	5 Mar 1987	13:32:47.34	1.179
63	5 Mar 1987	12:38:16.86	1.178	64	5 Mar 1987	11:11:25.73	1.177
65	5 Mar 1987	13:30:42.02	1.176	66	27 Feb 1987	09:42:57.64	1.173
67	5 Mar 1987	10:36:45.93	1.172	68	5 Mar 1987	12:46:31.91	1.164
69	27 Feb 1987	09:16:13.86	1.155	70	5 Mar 1987	14:35:20.67	1.155
71	5 Mar 1987	01:55:12.27	1.147	72	5 Mar 1987	10:51:05.92	1.131
73	5 Mar 1987	11:04:11.67	1.131	74	5 Mar 1987	01:41:38.76	1.128
75	5 Mar 1987	01:55:12.21	1.113	76	5 Mar 1987	08:34:29.93	1.111
77	27 Feb 1987	05:45:21.91	1.104	78	26 Feb 1987	19:19:27.18	1.099
79	5 Mar 1987	13:29:28.49	1.087	80	27 Feb 1987	08:48:25.46	1.086
81	5 Mar 1987	10:46:35.94	1.085	82	27 Feb 1987	09:39:27.78	1.085
83	5 Mar 1987	13:32:51.25	1.079	84	5 Mar 1987	12:26:22.48	1.077
85	27 Feb 1987	07:37:10.35	1.069	86	27 Feb 1987	07:59:32.75	1.064
87	5 Mar 1987	01:41:28.85	1.063	88	5 Mar 1987	08:55:05.82	1.054
89	5 Mar 1987	11:35:54.23	1.054	90	5 Mar 1987	11:09:53.36	1.046
91	27 Feb 1987	07:50:52.94	1.032	92	5 Mar 1987	12:17:43.00	1.032
93	5 Mar 1987	12:47:11.68	1.031	94	5 Mar 1987	10:23:56.11	1.028
95	5 Mar 1987	07:54:56.84	1.026	96	5 Mar 1987	14:27:14.08	1.025
97	5 Mar 1987	10:45:29.20	1.020	98	5 Mar 1987	17:57:26.28	1.017
99	27 Feb 1987	07:35:28.73	1.012	100	5 Mar 1987	17:53:30.72	1.011
101	5 Mar 1987	13:29:28.43	1.011	102	5 Mar 1987	12:20:18.15	1.005
103	27 Feb 1987	09:13:21.21	1.002	104	5 Mar 1987	13:09:52.57	1.001
105	5 Mar 1987	12:45:07.15	1.001	106	27 Feb 1987	08:38:17.65	.999
107	5 Mar 1987	08:06:03.94	.997	108	5 Mar 1987	12:30:18.88	.996
109	5 Mar 1987	11:24:50.75	.996	110	27 Feb 1987	07:38:31.23	.993
111	25 Feb 1987	07:29:41.06	.993	112	26 Feb 1987	18:36:42.93	.991
113	5 Mar 1987	11:19:52.30	.989	114	27 Feb 1987	07:50:55.13	.986
115	5 Mar 1987	10:37:34.84	.986	116	27 Feb 1987	09:39:27.85	.978
117	27 Feb 1987	07:45:10.58	.972	118	5 Mar 1987	01:55:12.14	.970
119	5 Mar 1987	12:05:24.72	.968	120	5 Mar 1987	10:41:06.28	.962
121	5 Mar 1987	13:09:51.91	.959	122	5 Mar 1987	13:27:13.12	.958
123	5 Mar 1987	00:32:36.67	.958	124	5 Mar 1987	01:41:39.25	.956
125	5 Mar 1987	10:29:01.89	.943	126	5 Mar 1987	01:41:38.97	.940
127	5 Mar 1987	13:34:59.07	.940	128	5 Mar 1987	13:37:24.57	.938
129	5 Mar 1987	07:54:31.89	.938	130	27 Feb 1987	04:44:21.40	.938

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
131	5 Mar 1987	10:45:29.08	.937	132	5 Mar 1987	08:52:27.74	.936
133	5 Mar 1987	11:04:11.38	.935	134	27 Feb 1987	05:45:21.72	.935
135	5 Mar 1987	12:59:56.64	.934	136	27 Feb 1987	07:03:38.04	.931
137	5 Mar 1987	13:54:47.34	.930	138	5 Mar 1987	14:30:40.70	.928
139	5 Mar 1987	13:25:27.14	.928	140	5 Mar 1987	14:43:41.03	.925
141	27 Feb 1987	07:37:07.12	.924	142	27 Feb 1987	07:12:54.72	.922
143	5 Mar 1987	10:44:05.01	.916	144	27 Feb 1987	05:43:53.20	.911
145	5 Mar 1987	14:39:41.97	.910	146	5 Mar 1987	12:38:14.91	.906
147	5 Mar 1987	12:20:18.06	.900	148	26 Feb 1987	18:36:42.73	.898
149	27 Feb 1987	05:42:23.36	.889	150	5 Mar 1987	11:10:42.11	.887
151	5 Mar 1987	13:30:41.62	.886	152	5 Mar 1987	17:46:02.29	.884
153	27 Feb 1987	05:57:26.64	.881	154	5 Mar 1987	12:34:13.32	.880
155	26 Feb 1987	18:25:24.84	.878	156	26 Feb 1987	18:36:43.02	.874
157	5 Mar 1987	12:18:41.49	.873	158	5 Mar 1987	14:46:47.37	.873
159	27 Feb 1987	04:50:43.86	.867	160	5 Mar 1987	13:27:20.48	.866
161	5 Mar 1987	12:47:11.02	.859	162	27 Feb 1987	08:53:59.01	.858
163	26 Feb 1987	19:47:01.70	.857	164	5 Mar 1987	13:54:55.42	.855
165	27 Feb 1987	09:12:45.32	.854	166	5 Mar 1987	12:05:41.32	.853
167	5 Mar 1987	14:17:08.25	.850	168	5 Mar 1987	13:33:26.92	.845
169	5 Mar 1987	12:21:57.49	.845	170	5 Mar 1987	12:20:18.26	.842
171	5 Mar 1987	12:41:16.96	.831	172	27 Feb 1987	04:50:43.94	.830
173	5 Mar 1987	14:43:21.08	.830	174	27 Feb 1987	04:45:07.56	.826
175	5 Mar 1987	13:04:20.92	.824	176	26 Feb 1987	19:26:37.03	.819
177	5 Mar 1987	13:08:44.07	.815	178	5 Mar 1987	12:08:36.61	.811
179	27 Feb 1987	05:54:02.91	.809	180	5 Mar 1987	10:09:22.61	.809
181	27 Feb 1987	06:04:06.87	.807	182	5 Mar 1987	11:34:15.19	.807
183	5 Mar 1987	11:35:22.61	.802	184	26 Feb 1987	18:40:46.03	.799
185	27 Feb 1987	05:54:02.25	.798	186	27 Feb 1987	06:07:23.71	.797
187	27 Feb 1987	05:54:02.43	.796	188	5 Mar 1987	11:30:02.48	.796
189	5 Mar 1987	10:52:54.55	.794	190	27 Feb 1987	09:00:20.54	.793
191	27 Feb 1987	07:09:02.93	.792	192	5 Mar 1987	13:33:27.01	.791
193	5 Mar 1987	12:54:50.82	.787	194	5 Mar 1987	13:46:03.80	.786
195	5 Mar 1987	10:56:12.44	.785	196	27 Feb 1987	07:56:34.63	.782
197	27 Feb 1987	07:38:31.02	.781	198	5 Mar 1987	01:55:12.41	.778
199	5 Mar 1987	14:50:38.28	.776	200	5 Mar 1987	07:56:20.68	.770
201	5 Mar 1987	13:54:50.57	.769	202	5 Mar 1987	10:44:42.11	.767
203	27 Feb 1987	07:45:10.30	.766	204	5 Mar 1987	02:13:12.05	.766
205	27 Feb 1987	05:51:32.86	.763	206	27 Feb 1987	09:39:27.77	.763
207	26 Feb 1987	19:47:01.67	.761	208	27 Feb 1987	06:03:37.20	.760
209	5 Mar 1987	12:18:21.83	.757	210	5 Mar 1987	14:42:37.25	.757
211	5 Mar 1987	17:56:33.94	.753	212	5 Mar 1987	12:21:48.52	.751
213	27 Feb 1987	08:36:37.44	.749	214	27 Feb 1987	06:23:26.39	.749
215	26 Feb 1987	18:46:03.13	.743	216	5 Mar 1987	07:56:20.36	.742
217	5 Mar 1987	17:47:42.59	.740	218	5 Mar 1987	07:56:20.25	.739
219	27 Feb 1987	05:29:05.83	.739	220	5 Mar 1987	11:22:37.23	.737
221	5 Mar 1987	12:08:37.50	.735	222	27 Feb 1987	07:45:10.17	.733
223	27 Feb 1987	05:58:28.14	.731	224	27 Feb 1987	08:21:55.52	.730
225	5 Mar 1987	12:59:32.06	.730	226	5 Mar 1987	10:44:41.85	.730
227	5 Mar 1987	10:09:44.56	.723	228	5 Mar 1987	10:03:11.08	.720
229	5 Mar 1987	12:49:21.80	.714	230	5 Mar 1987	10:27:42.42	.713
231	5 Mar 1987	01:55:13.09	.713	232	27 Feb 1987	05:01:25.95	.712
233	27 Feb 1987	08:42:59.75	.709	234	5 Mar 1987	11:35:53.68	.707
235	5 Mar 1987	11:06:34.17	.706	236	5 Mar 1987	13:30:41.72	.705
237	27 Feb 1987	08:50:29.42	.704	238	5 Mar 1987	10:51:06.07	.702
239	5 Mar 1987	10:41:06.35	.701	240	5 Mar 1987	11:43:32.88	.697
241	27 Feb 1987	05:54:58.74	.696	242	26 Feb 1987	18:36:43.18	.696
243	5 Mar 1987	02:09:04.12	.695	244	5 Mar 1987	13:30:01.36	.694
245	5 Mar 1987	14:11:42.91	.693	246	5 Mar 1987	00:35:36.45	.692
247	27 Feb 1987	07:46:03.54	.692	248	5 Mar 1987	07:47:53.57	.690
249	5 Mar 1987	17:51:51.70	.688	250	5 Mar 1987	14:37:01.47	.683
251	5 Mar 1987	14:49:41.79	.681	252	5 Mar 1987	12:17:42.95	.681
253	5 Mar 1987	13:51:59.15	.679	254	5 Mar 1987	17:47:43.03	.678
255	26 Feb 1987	18:45:49.21	.676	256	27 Feb 1987	09:06:44.85	.676
257	26 Feb 1987	19:47:15.72	.673	258	27 Feb 1987	07:50:52.69	.672
259	5 Mar 1987	12:21:24.72	.672	260	5 Mar 1987	01:50:31.12	.671

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
261	27 Feb 1987	05:58:28.26	.670	262	5 Mar 1987	12:30:19.05	.669
263	27 Feb 1987	06:03:37.17	.668	264	26 Feb 1987	19:46:24.19	.667
265	26 Feb 1987	19:14:56.08	.666	266	27 Feb 1987	07:45:10.09	.666
267	5 Mar 1987	18:20:19.80	.663	268	5 Mar 1987	12:49:21.58	.661
269	5 Mar 1987	13:23:14.30	.659	270	5 Mar 1987	10:37:47.30	.658
271	5 Mar 1987	11:17:17.74	.658	272	5 Mar 1987	11:22:37.23	.657
273	26 Feb 1987	19:41:33.27	.653	274	5 Mar 1987	10:02:59.21	.653
275	27 Feb 1987	05:00:09.85	.652	276	5 Mar 1987	13:48:41.22	.651
277	5 Mar 1987	14:35:36.19	.651	278	5 Mar 1987	12:27:03.18	.650
279	5 Mar 1987	11:04:42.03	.647	280	27 Feb 1987	08:24:53.59	.647
281	27 Feb 1987	08:48:17.30	.646	282	27 Feb 1987	08:42:12.89	.644
283	5 Mar 1987	11:07:33.21	.642	284	5 Mar 1987	08:55:05.81	.642
285	5 Mar 1987	17:47:39.68	.638	286	27 Feb 1987	07:44:16.32	.632
287	27 Feb 1987	09:05:57.96	.631	288	5 Mar 1987	14:37:01.44	.627
289	26 Feb 1987	18:34:48.87	.626	290	26 Feb 1987	19:39:29.74	.625
291	5 Mar 1987	11:09:53.10	.624	292	27 Feb 1987	06:24:10.11	.621
293	5 Mar 1987	11:45:19.64	.620	294	27 Feb 1987	06:58:06.73	.619
295	5 Mar 1987	00:35:36.72	.619	296	27 Feb 1987	04:53:52.75	.616
297	5 Mar 1987	11:06:57.65	.616	298	5 Mar 1987	01:40:39.98	.615
299	5 Mar 1987	11:36:06.02	.614	300	5 Mar 1987	08:03:42.82	.614
301	5 Mar 1987	13:54:55.23	.614	302	5 Mar 1987	10:51:26.45	.613
303	27 Feb 1987	06:24:09.84	.613	304	26 Feb 1987	19:24:42.89	.612
305	5 Mar 1987	11:31:24.03	.612	306	5 Mar 1987	10:04:49.17	.610
307	5 Mar 1987	10:09:44.63	.608	308	27 Feb 1987	10:05:30.85	.607
309	5 Mar 1987	18:22:22.20	.605	310	5 Mar 1987	18:14:12.75	.603
311	27 Feb 1987	10:17:45.59	.602	312	5 Mar 1987	01:41:38.91	.601
313	5 Mar 1987	11:35:21.70	.599	314	5 Mar 1987	01:55:12.13	.598
315	5 Mar 1987	10:18:18.91	.594	316	27 Feb 1987	08:17:47.80	.594
317	5 Mar 1987	11:11:25.73	.592	318	5 Mar 1987	10:27:21.53	.590
319	26 Feb 1987	19:46:23.87	.588	320	5 Mar 1987	17:03:39.45	.588
321	5 Mar 1987	17:47:39.63	.588	322	5 Mar 1987	11:15:23.38	.588
323	5 Mar 1987	10:47:59.58	.588	324	5 Mar 1987	18:04:06.90	.586
325	5 Mar 1987	13:46:03.48	.585	326	26 Feb 1987	18:36:42.70	.584
327	5 Mar 1987	18:09:22.61	.582	328	27 Feb 1987	08:46:48.25	.581
329	5 Mar 1987	01:41:18.86	.580	330	27 Feb 1987	09:06:40.56	.578
331	5 Mar 1987	14:16:05.91	.578	332	27 Feb 1987	07:59:29.92	.574
333	5 Mar 1987	00:32:36.93	.574	334	5 Mar 1987	08:03:42.79	.570
335	27 Feb 1987	07:02:51.71	.570	336	5 Mar 1987	10:32:38.79	.570
337	5 Mar 1987	11:34:34.00	.569	338	5 Mar 1987	17:55:34.58	.569
339	27 Feb 1987	10:08:27.45	.567	340	27 Feb 1987	09:14:28.38	.566
341	27 Feb 1987	07:37:07.06	.566	342	25 Feb 1987	07:29:08.27	.565
343	5 Mar 1987	17:56:33.84	.565	344	26 Feb 1987	18:30:54.91	.564
345	26 Feb 1987	18:50:38.06	.563	346	5 Mar 1987	13:04:06.50	.562
347	5 Mar 1987	11:15:23.22	.561	348	5 Mar 1987	09:00:51.55	.557
349	5 Mar 1987	10:51:33.76	.557	350	27 Feb 1987	08:23:53.99	.555
351	5 Mar 1987	00:37:48.33	.554	352	27 Feb 1987	04:44:38.66	.552
353	26 Feb 1987	18:57:45.60	.552	354	5 Mar 1987	08:33:51.12	.552
355	26 Feb 1987	18:48:58.55	.552	356	5 Mar 1987	12:25:25.86	.551
357	5 Mar 1987	10:02:55.36	.550	358	5 Mar 1987	11:20:29.46	.550
359	5 Mar 1987	13:29:28.49	.549	360	5 Mar 1987	10:13:47.90	.549
361	27 Feb 1987	10:20:20.79	.548	362	5 Mar 1987	01:13:17.84	.548
363	5 Mar 1987	18:20:30.61	.548	364	26 Feb 1987	18:16:27.66	.547
365	5 Mar 1987	10:42:25.26	.547	366	5 Mar 1987	18:09:14.00	.544
367	5 Mar 1987	18:13:08.98	.543	368	5 Mar 1987	10:37:47.45	.540
369	27 Feb 1987	08:57:53.81	.539	370	27 Feb 1987	10:02:44.89	.539
371	27 Feb 1987	09:06:45.03	.539	372	5 Mar 1987	10:57:08.34	.537
373	5 Mar 1987	10:52:00.72	.537	374	27 Feb 1987	07:02:51.72	.535
375	5 Mar 1987	10:02:59.07	.534	376	26 Feb 1987	19:24:42.56	.531
377	5 Mar 1987	10:36:45.82	.531	378	5 Mar 1987	14:33:44.83	.529
379	5 Mar 1987	13:36:58.04	.529	380	5 Mar 1987	10:22:24.92	.528
381	5 Mar 1987	11:04:11.33	.527	382	5 Mar 1987	12:26:35.30	.527
383	5 Mar 1987	08:52:27.74	.525	384	5 Mar 1987	18:20:03.59	.524
385	5 Mar 1987	12:49:21.44	.524	386	27 Feb 1987	09:48:12.35	.521
387	5 Mar 1987	12:30:19.13	.519	388	27 Feb 1987	05:01:26.06	.517
389	5 Mar 1987	10:27:22.29	.516	390	27 Feb 1987	07:54:23.84	.515

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
391	5 Mar 1987	17:47:40.41	.515	392	5 Mar 1987	02:43:09.18	.514
393	27 Feb 1987	07:13:54.76	.513	394	5 Mar 1987	10:03:11.19	.512
395	5 Mar 1987	18:09:14.99	.510	396	5 Mar 1987	10:27:42.14	.509
397	27 Feb 1987	06:40:17.64	.508	398	26 Feb 1987	18:50:37.85	.507
399	5 Mar 1987	10:38:56.23	.506	400	5 Mar 1987	13:32:47.14	.505
401	27 Feb 1987	09:48:05.45	.504	402	27 Feb 1987	09:39:27.79	.503
403	5 Mar 1987	02:39:57.61	.502	404	27 Feb 1987	07:12:55.04	.502
405	26 Feb 1987	18:28:25.75	.501	406	5 Mar 1987	07:32:34.99	.500
407	27 Feb 1987	06:25:45.13	.500	408	5 Mar 1987	01:55:12.21	.499
409	5 Mar 1987	07:56:20.36	.497	410	27 Feb 1987	08:24:53.61	.496
411	5 Mar 1987	11:09:53.15	.496	412	27 Feb 1987	05:01:26.06	.495
413	27 Feb 1987	06:22:55.85	.495	414	5 Mar 1987	10:28:43.41	.495
415	27 Feb 1987	09:06:44.82	.491	416	27 Feb 1987	08:51:28.20	.491
417	27 Feb 1987	07:06:59.87	.490	418	27 Feb 1987	08:41:02.03	.490
419	27 Feb 1987	09:46:13.94	.488	420	27 Feb 1987	08:03:39.72	.488
421	5 Mar 1987	14:35:49.59	.487	422	5 Mar 1987	10:32:46.11	.486
423	27 Feb 1987	07:41:36.62	.486	424	27 Feb 1987	06:40:13.66	.486
425	5 Mar 1987	02:34:30.40	.485	426	27 Feb 1987	07:50:55.07	.484
427	5 Mar 1987	11:20:21.94	.482	428	5 Mar 1987	14:45:18.36	.481
429	25 Feb 1987	07:28:24.26	.478	430	5 Mar 1987	12:49:21.37	.477
431	27 Feb 1987	07:36:06.09	.476	432	5 Mar 1987	08:05:35.40	.475
433	27 Feb 1987	09:53:33.90	.474	434	27 Feb 1987	07:54:57.27	.473
435	5 Mar 1987	14:25:05.07	.473	436	5 Mar 1987	08:02:40.32	.472
437	26 Feb 1987	19:17:37.13	.472	438	26 Feb 1987	18:36:42.37	.472
439	5 Mar 1987	11:40:24.61	.472	440	5 Mar 1987	18:01:13.27	.471
441	5 Mar 1987	12:56:10.33	.471	442	27 Feb 1987	04:44:59.22	.471
443	5 Mar 1987	11:04:11.60	.469	444	27 Feb 1987	06:40:13.59	.468
445	27 Feb 1987	09:38:34.62	.468	446	27 Feb 1987	06:23:26.39	.468
447	5 Mar 1987	02:25:33.88	.467	448	26 Feb 1987	18:15:23.26	.467
449	27 Feb 1987	09:04:20.30	.467	450	27 Feb 1987	08:22:08.87	.465
451	27 Feb 1987	08:57:54.17	.464	452	5 Mar 1987	14:30:55.62	.464
453	5 Mar 1987	07:33:05.51	.464	454	5 Mar 1987	14:14:47.09	.464
455	5 Mar 1987	08:04:04.54	.463	456	5 Mar 1987	12:22:14.65	.462
457	5 Mar 1987	18:01:38.92	.460	458	5 Mar 1987	08:54:50.67	.460
459	5 Mar 1987	11:34:34.09	.460	460	26 Feb 1987	18:46:50.47	.459
461	27 Feb 1987	09:05:12.05	.459	462	5 Mar 1987	11:20:22.04	.459
463	27 Feb 1987	07:46:22.94	.458	464	27 Feb 1987	06:25:18.75	.455
465	5 Mar 1987	12:40:14.79	.454	466	27 Feb 1987	07:59:32.70	.453
467	25 Feb 1987	07:26:24.08	.453	468	5 Mar 1987	17:53:30.72	.453
469	27 Feb 1987	09:02:41.99	.452	470	25 Feb 1987	07:28:24.22	.451
471	5 Mar 1987	10:45:29.08	.451	472	5 Mar 1987	18:01:59.16	.450
473	27 Feb 1987	06:23:26.41	.448	474	27 Feb 1987	08:56:03.51	.446
475	27 Feb 1987	07:48:09.66	.446	476	5 Mar 1987	10:08:15.19	.445
477	27 Feb 1987	04:57:52.23	.445	478	5 Mar 1987	11:17:09.43	.443
479	27 Feb 1987	07:55:51.37	.442	480	26 Feb 1987	18:20:27.61	.441
481	5 Mar 1987	18:05:28.67	.440	482	5 Mar 1987	14:37:01.47	.439
483	27 Feb 1987	08:56:28.29	.439	484	5 Mar 1987	10:29:01.89	.439
485	5 Mar 1987	07:47:51.13	.439	486	5 Mar 1987	07:54:56.65	.439
487	27 Feb 1987	09:14:28.31	.439	488	5 Mar 1987	02:51:46.97	.438
489	5 Mar 1987	02:03:30.85	.438	490	5 Mar 1987	12:08:41.50	.438
491	5 Mar 1987	12:05:24.72	.437	492	5 Mar 1987	18:05:28.39	.437
493	5 Mar 1987	01:19:50.58	.434	494	27 Feb 1987	06:13:08.35	.434
495	5 Mar 1987	07:55:08.43	.434	496	5 Mar 1987	17:24:44.34	.432
497	27 Feb 1987	06:26:33.37	.432	498	27 Feb 1987	05:01:25.99	.431
499	27 Feb 1987	09:43:10.13	.429	500	5 Mar 1987	11:17:09.54	.428
501	5 Mar 1987	12:25:26.22	.426	502	5 Mar 1987	14:46:47.37	.424
503	27 Feb 1987	05:45:21.91	.424	504	25 Feb 1987	07:28:24.03	.424
505	5 Mar 1987	02:06:19.23	.423	506	27 Feb 1987	06:42:20.71	.423
507	27 Feb 1987	07:56:58.66	.423	508	5 Mar 1987	11:42:41.97	.422
509	5 Mar 1987	13:04:25.36	.422	510	27 Feb 1987	09:59:07.10	.420
511	5 Mar 1987	11:04:24.76	.420	512	5 Mar 1987	13:39:21.25	.420
513	5 Mar 1987	02:44:25.86	.419	514	27 Feb 1987	09:15:02.10	.418
515	5 Mar 1987	12:17:43.00	.418	516	26 Feb 1987	18:59:09.17	.418
517	5 Mar 1987	08:35:14.39	.417	518	27 Feb 1987	07:39:27.01	.417
519	26 Feb 1987	18:21:01.16	.417	520	27 Feb 1987	09:53:08.85	.416

FR 53.5	FR 52.0	FR 50.5	FR 51.0	FR 51.5	FR 52.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
521	27 Feb 1987	08:38:54.24	.416	522	5 Mar 1987	18:20:11.04	.416
523	5 Mar 1987	12:17:43.11	.414	524	27 Feb 1987	07:37:07.06	.414
525	5 Mar 1987	13:33:27.09	.413	526	27 Feb 1987	08:04:18.01	.412
527	26 Feb 1987	18:59:26.45	.412	528	27 Feb 1987	10:21:46.37	.411
529	27 Feb 1987	10:01:09.04	.410	530	5 Mar 1987	14:17:08.25	.410
531	25 Feb 1987	07:28:24.13	.410	532	27 Feb 1987	08:24:04.32	.407
533	5 Mar 1987	12:49:21.51	.406	534	5 Mar 1987	15:05:45.00	.406
535	5 Mar 1987	10:24:46.30	.405	536	5 Mar 1987	18:05:28.49	.404
537	5 Mar 1987	17:47:40.62	.403	538	5 Mar 1987	14:35:20.41	.402
539	5 Mar 1987	18:10:12.84	.402	540	5 Mar 1987	11:04:11.40	.401
541	27 Feb 1987	09:47:34.79	.401	542	27 Feb 1987	06:42:16.48	.400
543	5 Mar 1987	12:34:25.23	.398	544	26 Feb 1987	18:16:55.68	.399
545	5 Mar 1987	18:09:13.85	.395	546	26 Feb 1987	19:23:13.24	.399
547	5 Mar 1987	02:10:51.42	.395	548	27 Feb 1987	08:53:50.76	.395
549	5 Mar 1987	14:01:13.31	.394	550	5 Mar 1987	11:29:33.73	.394
551	26 Feb 1987	18:16:27.75	.394	552	26 Feb 1987	18:40:22.86	.393
553	5 Mar 1987	02:50:50.90	.392	554	26 Feb 1987	19:46:31.76	.391
555	5 Mar 1987	10:38:05.53	.390	556	27 Feb 1987	08:42:12.76	.390
557	27 Feb 1987	10:19:55.28	.389	558	27 Feb 1987	05:54:02.43	.389
559	26 Feb 1987	18:28:25.35	.389	560	27 Feb 1987	08:21:49.35	.388
561	5 Mar 1987	14:04:05.98	.388	562	5 Mar 1987	18:23:59.65	.388
563	27 Feb 1987	09:41:54.78	.387	564	5 Mar 1987	11:20:29.33	.386
565	5 Mar 1987	10:27:42.06	.386	566	26 Feb 1987	19:46:42.79	.385
567	26 Feb 1987	18:57:21.30	.384	568	5 Mar 1987	10:12:28.83	.384
569	27 Feb 1987	09:59:06.43	.384	570	5 Mar 1987	00:32:36.75	.383
571	26 Feb 1987	18:19:07.29	.383	572	26 Feb 1987	18:36:42.49	.383
573	5 Mar 1987	11:22:14.87	.382	574	5 Mar 1987	12:30:19.05	.381
575	27 Feb 1987	08:38:53.21	.381	576	5 Mar 1987	10:29:02.06	.380
577	27 Feb 1987	10:21:46.37	.380	578	27 Feb 1987	08:38:17.57	.380
579	5 Mar 1987	13:08:32.42	.378	580	5 Mar 1987	12:59:19.24	.378
581	5 Mar 1987	02:25:57.01	.377	582	5 Mar 1987	11:19:52.03	.377
583	5 Mar 1987	14:33:03.80	.377	584	5 Mar 1987	02:26:04.54	.376
585	5 Mar 1987	02:10:49.70	.376	586	5 Mar 1987	08:32:18.33	.374
587	5 Mar 1987	12:43:51.82	.373	588	27 Feb 1987	08:46:48.25	.373
589	5 Mar 1987	10:51:05.99	.372	590	5 Mar 1987	18:15:32.74	.369
591	5 Mar 1987	07:36:03.96	.368	592	5 Mar 1987	13:38:50.41	.368
593	5 Mar 1987	01:55:13.23	.368	594	26 Feb 1987	19:24:21.70	.367
595	5 Mar 1987	11:17:17.84	.367	596	27 Feb 1987	06:01:43.48	.366
597	27 Feb 1987	06:04:06.61	.365	598	5 Mar 1987	18:12:36.81	.364
599	27 Feb 1987	04:50:43.79	.364	600	5 Mar 1987	14:39:42.20	.364
601	5 Mar 1987	10:52:00.86	.363	602	5 Mar 1987	00:51:01.19	.362
603	27 Feb 1987	06:13:02.39	.362	604	27 Feb 1987	07:54:08.69	.362
605	26 Feb 1987	19:19:20.30	.362	606	26 Feb 1987	18:28:25.40	.362
607	5 Mar 1987	12:55:44.49	.361	608	27 Feb 1987	04:50:43.91	.360
609	5 Mar 1987	14:14:11.18	.359	610	26 Feb 1987	18:16:27.59	.359
611	5 Mar 1987	12:33:47.98	.358	612	27 Feb 1987	08:13:28.62	.356
613	5 Mar 1987	13:29:28.43	.356	614	5 Mar 1987	13:46:05.43	.356
615	5 Mar 1987	13:04:21.80	.355	616	27 Feb 1987	06:13:02.09	.355
617	5 Mar 1987	09:01:33.20	.355	618	27 Feb 1987	04:51:44.99	.354
619	26 Feb 1987	18:17:55.78	.354	620	5 Mar 1987	10:56:58.81	.353
621	5 Mar 1987	10:38:05.70	.350	622	27 Feb 1987	06:03:37.17	.350
623	5 Mar 1987	11:35:53.70	.349	624	5 Mar 1987	17:47:39.68	.349
625	5 Mar 1987	12:58:22.42	.349	626	5 Mar 1987	02:05:53.97	.349
627	5 Mar 1987	14:26:10.88	.349	628	5 Mar 1987	13:48:25.91	.348
629	5 Mar 1987	12:06:02.33	.348	630	27 Feb 1987	07:34:51.67	.348
631	5 Mar 1987	12:47:11.02	.347	632	27 Feb 1987	05:45:00.72	.347
633	5 Mar 1987	10:18:18.09	.346	634	5 Mar 1987	01:40:23.01	.346
635	5 Mar 1987	18:06:48.56	.346	636	5 Mar 1987	12:27:30.74	.346
637	26 Feb 1987	18:58:56.23	.345	638	5 Mar 1987	02:34:46.47	.345
639	27 Feb 1987	07:05:01.19	.345	640	26 Feb 1987	18:48:22.58	.345
641	26 Feb 1987	18:53:57.68	.345	642	27 Feb 1987	06:11:23.67	.344
643	5 Mar 1987	10:14:15.43	.344	644	27 Feb 1987	07:09:30.13	.343
645	27 Feb 1987	09:48:22.87	.343	646	27 Feb 1987	08:56:39.90	.342
647	25 Feb 1987	07:27:48.94	.342	648	27 Feb 1987	06:06:46.55	.342
649	27 Feb 1987	05:55:38.05	.341	650	27 Feb 1987	06:40:04.41	.341

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
651	5 Mar 1987	10:12:28.82	.340	652	5 Mar 1987	12:06:02.46	.340
653	27 Feb 1987	04:54:12.17	.339	654	27 Feb 1987	08:35:01.34	.338
655	5 Mar 1987	02:01:54.16	.338	656	27 Feb 1987	09:04:19.85	.337
657	27 Feb 1987	07:13:54.62	.337	658	5 Mar 1987	18:20:11.04	.336
659	5 Mar 1987	13:04:22.08	.333	660	27 Feb 1987	08:40:48.78	.333
661	26 Feb 1987	19:23:45.17	.331	662	5 Mar 1987	12:08:40.74	.331
663	27 Feb 1987	09:40:05.50	.331	664	27 Feb 1987	06:22:55.50	.330
665	27 Feb 1987	05:25:13.75	.329	666	26 Feb 1987	18:24:49.33	.329
667	5 Mar 1987	18:09:12.86	.328	668	27 Feb 1987	09:42:30.76	.327
669	5 Mar 1987	07:32:20.06	.327	670	27 Feb 1987	06:04:06.61	.327
671	5 Mar 1987	02:44:25.65	.327	672	27 Feb 1987	08:48:25.59	.326
673	27 Feb 1987	05:55:38.05	.326	674	5 Mar 1987	08:00:50.50	.326
675	26 Feb 1987	19:23:43.14	.326	676	27 Feb 1987	07:04:16.20	.325
677	26 Feb 1987	19:46:31.67	.325	678	5 Mar 1987	17:03:28.99	.324
679	26 Feb 1987	19:12:45.00	.324	680	26 Feb 1987	18:36:42.49	.324
681	26 Feb 1987	18:57:27.41	.323	682	5 Mar 1987	14:14:11.46	.322
683	26 Feb 1987	19:46:23.57	.322	684	5 Mar 1987	11:34:15.53	.322
685	5 Mar 1987	01:41:38.92	.322	686	5 Mar 1987	14:42:07.84	.321
687	27 Feb 1987	07:04:16.43	.321	688	26 Feb 1987	18:54:21.94	.320
689	5 Mar 1987	11:20:21.94	.320	690	25 Feb 1987	07:29:08.17	.320
691	5 Mar 1987	10:34:05.92	.320	692	5 Mar 1987	11:39:48.47	.320
693	27 Feb 1987	07:46:50.54	.319	694	27 Feb 1987	07:10:14.18	.319
695	5 Mar 1987	18:09:14.99	.319	696	26 Feb 1987	19:41:47.78	.316
697	5 Mar 1987	13:43:22.55	.316	698	5 Mar 1987	11:09:53.38	.316
699	5 Mar 1987	08:52:50.96	.316	700	25 Feb 1987	07:29:26.01	.316
701	27 Feb 1987	05:41:47.93	.315	702	27 Feb 1987	06:42:16.26	.314
703	25 Feb 1987	07:27:50.45	.314	704	26 Feb 1987	18:59:26.33	.313
705	5 Mar 1987	13:57:34.80	.313	706	27 Feb 1987	09:59:06.79	.313
707	27 Feb 1987	09:06:44.82	.313	708	5 Mar 1987	11:30:27.61	.313
709	27 Feb 1987	04:55:52.59	.313	710	5 Mar 1987	08:05:35.49	.313
711	5 Mar 1987	12:47:11.11	.311	712	26 Feb 1987	19:14:46.02	.311
713	27 Feb 1987	08:24:04.19	.311	714	5 Mar 1987	07:32:19.93	.309
715	5 Mar 1987	12:48:45.80	.309	716	5 Mar 1987	13:04:20.92	.309
717	27 Feb 1987	10:15:52.45	.308	718	5 Mar 1987	12:08:40.38	.307
719	5 Mar 1987	14:11:27.23	.306	720	5 Mar 1987	17:03:19.20	.306
721	27 Feb 1987	05:29:20.36	.306	722	26 Feb 1987	18:19:07.23	.305
723	5 Mar 1987	02:09:16.74	.305	724	5 Mar 1987	01:15:35.56	.304
725	5 Mar 1987	14:14:11.34	.304	726	5 Mar 1987	11:25:46.77	.304
727	5 Mar 1987	01:10:27.36	.303	728	5 Mar 1987	17:24:45.44	.302
729	5 Mar 1987	08:15:45.02	.302	730	27 Feb 1987	08:13:28.49	.302
731	26 Feb 1987	18:46:50.54	.301	732	5 Mar 1987	14:36:05.83	.300
733	26 Feb 1987	19:46:39.03	.300	734	5 Mar 1987	08:35:14.39	.300
735	27 Feb 1987	07:02:51.71	.299	736	5 Mar 1987	10:44:41.96	.299
737	27 Feb 1987	06:03:37.18	.298	738	25 Feb 1987	07:28:24.12	.298
739	27 Feb 1987	05:54:02.78	.297	740	5 Mar 1987	07:35:15.26	.297
741	5 Mar 1987	02:02:09.21	.296	742	27 Feb 1987	07:37:07.06	.296
743	5 Mar 1987	07:56:20.32	.295	744	26 Feb 1987	18:30:42.50	.295
745	5 Mar 1987	13:54:47.07	.295	746	27 Feb 1987	06:13:08.43	.295
747	27 Feb 1987	08:50:38.10	.294	748	5 Mar 1987	13:33:27.22	.294
749	25 Feb 1987	07:26:24.11	.294	750	27 Feb 1987	05:27:45.94	.293
751	26 Feb 1987	18:46:50.66	.293	752	26 Feb 1987	19:41:30.79	.293
753	27 Feb 1987	07:40:00.92	.293	754	5 Mar 1987	12:36:49.21	.292
755	5 Mar 1987	18:20:11.15	.292	756	5 Mar 1987	10:51:06.07	.292
757	5 Mar 1987	18:21:41.37	.292	758	26 Feb 1987	18:46:37.59	.292
759	5 Mar 1987	18:24:00.20	.290	760	5 Mar 1987	13:45:10.63	.290
761	26 Feb 1987	19:26:52.64	.290	762	27 Feb 1987	09:40:51.29	.289
763	5 Mar 1987	13:53:32.67	.289	764	5 Mar 1987	12:59:32.06	.289
765	5 Mar 1987	12:55:44.52	.288	766	5 Mar 1987	11:11:25.74	.288
767	5 Mar 1987	13:43:22.49	.288	768	5 Mar 1987	14:33:44.79	.287
769	27 Feb 1987	07:45:03.72	.285	770	27 Feb 1987	08:24:07.53	.285
771	27 Feb 1987	08:13:28.43	.284	772	5 Mar 1987	01:40:22.78	.284
773	5 Mar 1987	13:04:21.59	.284	774	5 Mar 1987	11:20:29.33	.283
775	26 Feb 1987	18:27:27.10	.283	776	27 Feb 1987	10:02:44.89	.283
777	5 Mar 1987	13:33:27.09	.283	778	5 Mar 1987	14:39:05.10	.282
779	5 Mar 1987	14:02:54.26	.281	780	5 Mar 1987	08:05:35.40	.281

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
781	26 Feb 1987	19:19:06.34	.281	782	26 Feb 1987	18:19:07.15	.280
783	27 Feb 1987	08:42:57.84	.278	784	5 Mar 1987	14:26:10.32	.277
785	27 Feb 1987	08:38:47.37	.277	786	27 Feb 1987	08:13:28.43	.277
787	5 Mar 1987	09:01:10.67	.277	788	5 Mar 1987	08:15:13.01	.277
789	27 Feb 1987	09:12:29.77	.276	790	5 Mar 1987	11:05:46.13	.276
791	5 Mar 1987	12:38:14.54	.276	792	27 Feb 1987	08:45:59.15	.272
793	5 Mar 1987	02:01:54.39	.272	794	5 Mar 1987	18:09:13.98	.272
795	26 Feb 1987	18:36:42.49	.272	796	5 Mar 1987	00:58:56.16	.270
797	27 Feb 1987	05:55:38.03	.270	798	27 Feb 1987	06:45:39.65	.270
799	5 Mar 1987	00:35:36.68	.269	800	27 Feb 1987	09:48:05.45	.269
801	27 Feb 1987	06:15:25.58	.269	802	26 Feb 1987	18:46:54.42	.268
803	5 Mar 1987	17:24:44.65	.268	804	26 Feb 1987	18:25:23.77	.268
805	5 Mar 1987	08:05:54.64	.268	806	26 Feb 1987	19:39:11.32	.266
807	26 Feb 1987	19:41:31.13	.265	808	27 Feb 1987	08:56:30.40	.265
809	5 Mar 1987	02:10:51.94	.263	810	5 Mar 1987	14:49:37.87	.263
811	27 Feb 1987	08:24:53.61	.262	812	26 Feb 1987	19:13:19.01	.261
813	26 Feb 1987	19:26:05.28	.261	814	5 Mar 1987	17:51:17.12	.261
815	27 Feb 1987	06:44:52.92	.261	816	27 Feb 1987	06:11:23.69	.260
817	26 Feb 1987	19:13:01.47	.260	818	5 Mar 1987	10:25:44.39	.259
819	5 Mar 1987	10:09:44.69	.259	820	5 Mar 1987	12:34:22.56	.258
821	27 Feb 1987	07:12:54.71	.258	822	5 Mar 1987	00:31:00.11	.257
823	5 Mar 1987	13:44:46.18	.257	824	27 Feb 1987	07:59:29.92	.256
825	5 Mar 1987	18:04:13.15	.256	826	26 Feb 1987	19:25:19.24	.256
827	26 Feb 1987	18:16:12.84	.255	828	5 Mar 1987	12:26:22.29	.255
829	5 Mar 1987	02:43:05.48	.255	830	5 Mar 1987	02:53:44.34	.254
831	27 Feb 1987	04:49:01.29	.254	832	5 Mar 1987	12:24:58.04	.252
833	5 Mar 1987	00:58:56.23	.252	834	5 Mar 1987	17:53:12.93	.252
835	27 Feb 1987	06:42:21.97	.251	836	27 Feb 1987	07:14:07.18	.251
837	5 Mar 1987	14:41:24.99	.251	838	27 Feb 1987	07:02:51.79	.251
839	5 Mar 1987	14:13:50.92	.250	840	27 Feb 1987	05:48:24.06	.250
841	5 Mar 1987	02:10:06.66	.248	842	5 Mar 1987	11:42:41.97	.247
843	27 Feb 1987	09:43:32.96	.247	844	5 Mar 1987	14:22:26.59	.246
845	27 Feb 1987	07:35:05.73	.246	846	5 Mar 1987	18:20:11.04	.246
847	27 Feb 1987	06:13:02.09	.245	848	25 Feb 1987	07:27:59.31	.245
849	5 Mar 1987	08:30:56.21	.245	850	27 Feb 1987	08:56:28.65	.245
851	5 Mar 1987	12:48:39.92	.244	852	27 Feb 1987	04:55:29.09	.244
853	5 Mar 1987	13:48:40.89	.244	854	26 Feb 1987	19:23:42.96	.243
855	26 Feb 1987	19:41:30.86	.242	856	5 Mar 1987	12:38:14.77	.242
857	5 Mar 1987	14:25:32.07	.241	858	27 Feb 1987	06:25:18.79	.241
859	26 Feb 1987	18:28:25.28	.241	860	5 Mar 1987	17:03:28.92	.240
861	5 Mar 1987	10:44:41.85	.240	862	26 Feb 1987	18:19:07.23	.240
863	5 Mar 1987	01:15:35.46	.240	864	5 Mar 1987	08:33:50.74	.240
865	5 Mar 1987	08:35:14.39	.238	866	5 Mar 1987	13:53:32.62	.238
867	26 Feb 1987	18:46:26.94	.237	868	27 Feb 1987	10:20:08.27	.236
869	5 Mar 1987	00:46:12.51	.235	870	5 Mar 1987	13:26:34.66	.234
871	5 Mar 1987	18:19:54.82	.234	872	27 Feb 1987	10:17:45.62	.233
873	27 Feb 1987	05:45:21.98	.233	874	27 Feb 1987	08:03:39.72	.233
875	27 Feb 1987	08:23:11.56	.231	876	27 Feb 1987	06:40:13.59	.231
877	5 Mar 1987	12:11:57.94	.231	878	5 Mar 1987	17:34:45.90	.231
879	5 Mar 1987	00:35:36.39	.231	880	5 Mar 1987	10:18:45.39	.231
881	27 Feb 1987	08:05:05.03	.230	882	5 Mar 1987	00:45:27.39	.230
883	27 Feb 1987	10:21:46.37	.228	884	5 Mar 1987	01:54:47.68	.228
885	5 Mar 1987	02:53:54.01	.227	886	5 Mar 1987	14:25:05.07	.227
887	5 Mar 1987	02:44:25.88	.226	888	5 Mar 1987	14:39:10.21	.225
889	5 Mar 1987	08:36:47.52	.225	890	5 Mar 1987	11:45:19.64	.225
891	5 Mar 1987	14:37:01.44	.223	892	5 Mar 1987	02:43:09.18	.222
893	5 Mar 1987	14:22:26.59	.222	894	27 Feb 1987	08:57:53.81	.222
895	27 Feb 1987	08:13:28.43	.221	896	27 Feb 1987	10:05:35.66	.220
897	5 Mar 1987	13:08:32.41	.220	898	27 Feb 1987	05:25:37.00	.219
899	27 Feb 1987	07:04:47.13	.218	900	27 Feb 1987	10:20:37.47	.218
901	27 Feb 1987	09:04:19.85	.218	902	26 Feb 1987	18:44:42.25	.217
903	5 Mar 1987	12:08:41.27	.217	904	5 Mar 1987	17:03:31.14	.216
905	5 Mar 1987	07:35:13.40	.215	906	5 Mar 1987	12:20:18.15	.215
907	5 Mar 1987	14:26:10.39	.215	908	26 Feb 1987	19:41:22.21	.215
909	26 Feb 1987	18:17:13.50	.214	910	27 Feb 1987	04:46:06.97	.213

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
911	5 Mar 1987	14:26:24.28	.212	912	27 Feb 1987	05:54:58.74	.212
913	5 Mar 1987	18:14:27.33	.211	914	5 Mar 1987	12:54:55.06	.210
915	5 Mar 1987	10:38:18.85	.209	916	27 Feb 1987	05:54:02.57	.208
917	5 Mar 1987	10:04:41.42	.206	918	5 Mar 1987	01:14:30.54	.206
919	5 Mar 1987	13:04:25.36	.206	920	27 Feb 1987	10:01:08.68	.206
921	5 Mar 1987	13:46:14.04	.205	922	5 Mar 1987	07:54:56.75	.205
923	27 Feb 1987	08:34:38.90	.205	924	5 Mar 1987	15:05:45.63	.205
925	27 Feb 1987	08:56:30.40	.205	926	27 Feb 1987	08:13:28.62	.204
927	27 Feb 1987	05:25:37.88	.204	928	27 Feb 1987	04:47:20.24	.204
929	5 Mar 1987	02:01:53.86	.204	930	5 Mar 1987	12:40:29.10	.204
931	27 Feb 1987	05:41:21.49	.203	932	27 Feb 1987	08:34:44.76	.203
933	5 Mar 1987	14:13:50.98	.202	934	27 Feb 1987	10:05:30.81	.202
935	27 Feb 1987	09:14:28.31	.201	936	27 Feb 1987	08:22:19.14	.200
937	5 Mar 1987	15:05:45.41	.200	938	5 Mar 1987	18:16:06.97	.199
939	27 Feb 1987	08:19:56.05	.198	940	5 Mar 1987	12:40:29.20	.198
941	26 Feb 1987	19:41:22.28	.198	942	27 Feb 1987	10:05:30.85	.198
943	5 Mar 1987	08:16:00.32	.198	944	27 Feb 1987	10:05:30.81	.197
945	5 Mar 1987	00:58:56.18	.197	946	26 Feb 1987	19:41:22.14	.197
947	5 Mar 1987	02:10:49.70	.197	948	27 Feb 1987	05:28:09.47	.197
949	27 Feb 1987	10:03:20.29	.197	950	26 Feb 1987	18:53:58.00	.197
951	5 Mar 1987	14:26:51.42	.196	952	27 Feb 1987	07:04:01.09	.196
953	5 Mar 1987	07:55:08.49	.195	954	27 Feb 1987	08:23:17.12	.195
955	27 Feb 1987	05:56:56.80	.195	956	26 Feb 1987	19:46:42.79	.195
957	27 Feb 1987	08:56:39.90	.195	958	5 Mar 1987	00:58:56.22	.194
959	5 Mar 1987	01:09:42.40	.194	960	26 Feb 1987	18:58:03.59	.194
961	5 Mar 1987	11:04:24.76	.193	962	27 Feb 1987	09:10:03.89	.193
963	5 Mar 1987	08:33:50.74	.192	964	26 Feb 1987	18:59:09.17	.192
965	27 Feb 1987	05:42:07.67	.192	966	5 Mar 1987	14:22:26.75	.192
967	27 Feb 1987	04:59:43.82	.192	968	5 Mar 1987	18:05:28.39	.191
969	27 Feb 1987	06:26:32.72	.191	970	5 Mar 1987	08:35:14.53	.190
971	5 Mar 1987	13:54:47.00	.189	972	5 Mar 1987	02:26:04.47	.189
973	27 Feb 1987	09:47:41.86	.188	974	5 Mar 1987	00:58:56.19	.188
975	27 Feb 1987	05:45:21.91	.187	976	26 Feb 1987	18:38:06.19	.187
977	5 Mar 1987	02:44:25.52	.187	978	5 Mar 1987	14:45:18.53	.186
979	5 Mar 1987	10:03:11.19	.186	980	5 Mar 1987	12:48:40.06	.185
981	27 Feb 1987	09:02:47.07	.185	982	5 Mar 1987	01:05:39.63	.185
983	5 Mar 1987	00:46:12.30	.185	984	5 Mar 1987	08:14:54.71	.184
985	26 Feb 1987	18:25:52.76	.184	986	27 Feb 1987	09:10:15.93	.184
987	27 Feb 1987	08:35:01.33	.184	988	26 Feb 1987	19:18:43.94	.184
989	27 Feb 1987	05:01:26.12	.184	990	27 Feb 1987	10:06:34.69	.184
991	27 Feb 1987	06:15:25.41	.183	992	5 Mar 1987	02:41:32.46	.182
993	5 Mar 1987	10:13:47.47	.182	994	5 Mar 1987	07:55:04.32	.182
995	5 Mar 1987	02:54:14.62	.180	996	26 Feb 1987	19:24:42.56	.180
997	27 Feb 1987	08:36:37.45	.180	998	26 Feb 1987	19:24:42.56	.180
999	27 Feb 1987	09:57:55.63	.179	1000	27 Feb 1987	07:37:23.97	.178
1001	26 Feb 1987	19:46:31.76	.178	1002	5 Mar 1987	01:00:13.06	.178
1003	5 Mar 1987	09:01:00.46	.177	1004	27 Feb 1987	05:25:13.67	.177
1005	5 Mar 1987	12:53:26.63	.176	1006	5 Mar 1987	17:24:44.29	.176
1007	27 Feb 1987	08:04:35.97	.176	1008	5 Mar 1987	10:24:32.78	.175
1009	27 Feb 1987	05:01:25.99	.175	1010	27 Feb 1987	04:47:44.56	.175
1011	27 Feb 1987	09:10:03.89	.173	1012	5 Mar 1987	14:11:31.41	.173
1013	26 Feb 1987	19:23:33.55	.173	1014	5 Mar 1987	08:14:54.68	.173
1015	5 Mar 1987	02:10:06.01	.173	1016	5 Mar 1987	02:25:56.98	.171
1017	5 Mar 1987	13:04:06.32	.171	1018	26 Feb 1987	19:22:44.35	.171
1019	27 Feb 1987	07:13:23.33	.171	1020	27 Feb 1987	10:00:02.51	.171
1021	5 Mar 1987	14:49:14.14	.170	1022	5 Mar 1987	10:18:45.58	.170
1023	5 Mar 1987	07:47:33.02	.170	1024	5 Mar 1987	00:37:11.35	.169
1025	5 Mar 1987	07:56:20.35	.169	1026	5 Mar 1987	17:03:03.14	.169
1027	5 Mar 1987	10:14:14.76	.169	1028	5 Mar 1987	18:03:51.72	.168
1029	5 Mar 1987	14:42:07.93	.168	1030	5 Mar 1987	07:56:22.86	.168
1031	26 Feb 1987	19:46:23.64	.167	1032	5 Mar 1987	02:34:41.07	.166
1033	26 Feb 1987	19:18:37.01	.166	1034	5 Mar 1987	14:25:33.50	.166
1035	27 Feb 1987	08:22:56.58	.165	1036	27 Feb 1987	07:56:02.45	.165
1037	5 Mar 1987	10:13:47.47	.164	1038	27 Feb 1987	10:02:44.54	.164
1039	5 Mar 1987	08:14:54.75	.164	1040	26 Feb 1987	19:41:36.70	.163

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1041	5 Mar	1987 07:36:40.97	.161	1042	5 Mar	1987 11:43:03.77	.161
1043	5 Mar	1987 14:54:08.69	.160	1044	5 Mar	1987 12:53:26.48	.160
1045	5 Mar	1987 11:04:13.97	.159	1046	5 Mar	1987 02:10:05.90	.158
1047	27 Feb	1987 06:13:02.61	.158	1048	27 Feb	1987 10:16:55.12	.157
1049	5 Mar	1987 14:49:14.16	.157	1050	27 Feb	1987 08:05:04.96	.157
1051	5 Mar	1987 13:29:28.49	.157	1052	5 Mar	1987 11:04:14.01	.156
1053	26 Feb	1987 18:28:25.35	.156	1054	5 Mar	1987 14:45:18.40	.156
1055	5 Mar	1987 02:09:16.71	.155	1056	27 Feb	1987 07:03:38.04	.155
1057	26 Feb	1987 18:19:07.23	.155	1058	5 Mar	1987 12:30:18.88	.154
1059	5 Mar	1987 17:03:11.92	.153	1060	27 Feb	1987 08:13:28.42	.153
1061	5 Mar	1987 11:42:41.97	.153	1062	5 Mar	1987 11:04:11.67	.153
1063	5 Mar	1987 14:49:38.09	.152	1064	5 Mar	1987 17:51:17.29	.152
1065	27 Feb	1987 08:00:37.90	.150	1066	5 Mar	1987 08:30:56.21	.150
1067	26 Feb	1987 18:46:37.59	.150	1068	5 Mar	1987 02:24:17.64	.149
1069	5 Mar	1987 12:53:26.10	.149	1070	5 Mar	1987 02:43:09.18	.148
1071	5 Mar	1987 00:51:01.59	.146	1072	5 Mar	1987 08:31:12.42	.145
1073	27 Feb	1987 04:56:22.32	.144	1074	5 Mar	1987 00:31:00.11	.143
1075	26 Feb	1987 18:57:45.57	.143	1076	5 Mar	1987 02:01:54.16	.143
1077	5 Mar	1987 00:51:01.19	.143	1078	5 Mar	1987 13:46:34.21	.142
1079	5 Mar	1987 13:34:59.07	.142	1080	5 Mar	1987 01:41:59.22	.142
1081	5 Mar	1987 02:24:07.89	.141	1082	26 Feb	1987 19:19:38.76	.140
1083	5 Mar	1987 14:03:13.17	.140	1084	5 Mar	1987 02:53:36.50	.140
1085	5 Mar	1987 00:35:36.49	.140	1086	5 Mar	1987 18:09:13.85	.139
1087	5 Mar	1987 07:32:20.18	.139	1088	5 Mar	1987 02:34:44.95	.139
1089	5 Mar	1987 13:30:41.80	.138	1090	5 Mar	1987 09:00:57.95	.138
1091	5 Mar	1987 14:25:33.63	.138	1092	5 Mar	1987 01:05:39.60	.137
1093	5 Mar	1987 08:16:09.64	.137	1094	27 Feb	1987 10:05:31.06	.137
1095	5 Mar	1987 18:06:48.53	.137	1096	5 Mar	1987 18:21:14.01	.136
1097	5 Mar	1987 02:01:53.86	.136	1098	5 Mar	1987 08:52:27.67	.136
1099	27 Feb	1987 08:05:04.83	.135	1100	27 Feb	1987 08:36:18.93	.135
1101	5 Mar	1987 08:36:40.11	.135	1102	5 Mar	1987 11:19:51.84	.134
1103	27 Feb	1987 06:41:27.62	.134	1104	5 Mar	1987 00:46:33.10	.134
1105	5 Mar	1987 12:12:41.27	.133	1106	27 Feb	1987 06:13:02.39	.133
1107	27 Feb	1987 08:05:04.96	.133	1108	5 Mar	1987 10:53:22.27	.132
1109	5 Mar	1987 07:47:26.85	.132	1110	5 Mar	1987 07:47:26.75	.131
1111	27 Feb	1987 05:27:30.10	.131	1112	5 Mar	1987 12:57:10.41	.131
1113	5 Mar	1987 18:09:14.03	.130	1114	27 Feb	1987 06:15:25.41	.130
1115	27 Feb	1987 10:05:30.85	.129	1116	5 Mar	1987 10:46:48.58	.129
1117	26 Feb	1987 18:38:06.08	.128	1118	5 Mar	1987 09:01:25.09	.127
1119	5 Mar	1987 02:51:18.81	.127	1120	27 Feb	1987 06:42:28.63	.126
1121	5 Mar	1987 02:51:18.98	.126	1122	5 Mar	1987 08:30:39.97	.126
1123	5 Mar	1987 02:10:54.95	.125	1124	27 Feb	1987 05:29:05.83	.125
1125	27 Feb	1987 10:16:12.06	.124	1126	26 Feb	1987 19:19:38.86	.123
1127	5 Mar	1987 02:44:25.32	.123	1128	5 Mar	1987 08:14:55.50	.122
1129	27 Feb	1987 10:02:37.03	.121	1130	5 Mar	1987 15:05:47.06	.121
1131	27 Feb	1987 06:25:45.13	.121	1132	5 Mar	1987 08:15:13.32	.120
1133	5 Mar	1987 12:53:26.10	.120	1134	27 Feb	1987 05:26:07.32	.120
1135	5 Mar	1987 02:10:44.06	.120	1136	5 Mar	1987 13:53:32.62	.119
1137	5 Mar	1987 14:25:53.23	.119	1138	5 Mar	1987 17:44:47.63	.118
1139	5 Mar	1987 00:47:29.47	.117	1140	27 Feb	1987 10:10:28.73	.117
1141	27 Feb	1987 08:04:59.10	.116	1142	27 Feb	1987 08:05:04.96	.116
1143	5 Mar	1987 14:02:43.37	.116	1144	5 Mar	1987 01:41:38.92	.116
1145	27 Feb	1987 08:00:37.90	.115	1146	27 Feb	1987 04:50:32.95	.114
1147	5 Mar	1987 02:34:15.72	.114	1148	27 Feb	1987 08:05:04.83	.113
1149	5 Mar	1987 07:32:41.82	.113	1150	27 Feb	1987 10:06:33.12	.112
1151	27 Feb	1987 08:19:51.65	.112	1152	5 Mar	1987 07:36:03.96	.112
1153	5 Mar	1987 08:55:05.86	.111	1154	27 Feb	1987 09:06:45.39	.110
1155	26 Feb	1987 19:40:02.14	.110	1156	5 Mar	1987 08:15:13.01	.110
1157	27 Feb	1987 06:42:20.35	.110	1158	5 Mar	1987 13:53:32.69	.110
1159	27 Feb	1987 05:45:21.91	.109	1160	27 Feb	1987 06:00:41.21	.108
1161	5 Mar	1987 13:43:16.12	.108	1162	5 Mar	1987 11:45:19.88	.107
1163	5 Mar	1987 02:24:33.97	.107	1164	5 Mar	1987 01:17:28.35	.107
1165	27 Feb	1987 09:57:36.93	.107	1166	27 Feb	1987 10:10:10.38	.106
1167	27 Feb	1987 08:34:44.76	.106	1168	5 Mar	1987 07:47:36.49	.106
1169	5 Mar	1987 17:03:34.14	.105	1170	5 Mar	1987 09:01:13.08	.105

FR 53.5	FR 52.0	FR 50.5	FR 51.0	FR 51.5	FR 52.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1171	5 Mar 1987	14:36:05.83	.105	1172	27 Feb 1987	08:19:51.58	.105
1173	5 Mar 1987	17:03:31.04	.105	1174	5 Mar 1987	15:05:47.74	.105
1175	5 Mar 1987	12:08:42.46	.104	1176	5 Mar 1987	14:17:24.53	.104
1177	5 Mar 1987	02:34:30.17	.103	1178	27 Feb 1987	08:22:19.14	.103
1179	5 Mar 1987	08:16:09.82	.102	1180	5 Mar 1987	14:49:14.17	.102
1181	26 Feb 1987	19:41:22.28	.101	1182	27 Feb 1987	09:12:45.17	.101
1183	27 Feb 1987	08:42:12.89	.101	1184	5 Mar 1987	14:03:13.34	.100
1185	26 Feb 1987	19:41:30.86	.100	1186	5 Mar 1987	13:54:47.17	.099
1187	5 Mar 1987	13:53:32.69	.099	1188	5 Mar 1987	00:46:33.11	.099
1189	5 Mar 1987	17:56:33.66	.099	1190	5 Mar 1987	08:53:11.57	.098
1191	27 Feb 1987	05:48:24.06	.098	1192	27 Feb 1987	09:05:34.37	.098
1193	5 Mar 1987	02:39:00.61	.098	1194	5 Mar 1987	14:11:09.21	.098
1195	27 Feb 1987	05:29:33.24	.097	1196	5 Mar 1987	14:01:02.18	.097
1197	5 Mar 1987	01:09:13.93	.096	1198	5 Mar 1987	02:01:08.97	.096
1199	5 Mar 1987	14:50:38.38	.096	1200	5 Mar 1987	01:13:17.84	.096
1201	5 Mar 1987	17:53:12.93	.092	1202	27 Feb 1987	06:44:54.11	.092
1203	5 Mar 1987	10:06:52.84	.092	1204	27 Feb 1987	09:02:41.99	.092
1205	5 Mar 1987	17:34:34.30	.091	1206	5 Mar 1987	10:53:22.24	.091
1207	5 Mar 1987	18:03:51.80	.090	1208	5 Mar 1987	07:47:06.25	.090
1209	5 Mar 1987	14:14:43.67	.089	1210	5 Mar 1987	00:47:29.84	.088
1211	5 Mar 1987	01:00:13.06	.087	1212	5 Mar 1987	07:47:36.59	.087
1213	5 Mar 1987	07:47:32.81	.087	1214	5 Mar 1987	11:20:21.94	.086
1215	27 Feb 1987	10:20:37.41	.086	1216	27 Feb 1987	09:47:23.07	.085
1217	5 Mar 1987	09:01:00.34	.085	1218	5 Mar 1987	18:19:54.82	.085
1219	27 Feb 1987	08:24:53.61	.085	1220	27 Feb 1987	08:34:45.73	.085
1221	27 Feb 1987	07:59:32.69	.084	1222	5 Mar 1987	12:17:43.00	.084
1223	27 Feb 1987	08:04:49.06	.083	1224	27 Feb 1987	09:43:32.96	.083
1225	5 Mar 1987	01:09:13.98	.083	1226	26 Feb 1987	19:19:38.86	.082
1227	27 Feb 1987	10:05:30.85	.081	1228	26 Feb 1987	18:53:58.00	.081
1229	5 Mar 1987	02:34:16.83	.080	1230	5 Mar 1987	14:14:40.96	.080
1231	5 Mar 1987	15:05:45.35	.079	1232	5 Mar 1987	13:44:46.18	.078
1233	27 Feb 1987	08:15:26.17	.078	1234	5 Mar 1987	01:10:37.74	.078
1235	5 Mar 1987	10:38:05.53	.076	1236	26 Feb 1987	18:26:51.99	.076
1237	5 Mar 1987	13:54:50.57	.076	1238	5 Mar 1987	11:40:48.52	.075
1239	5 Mar 1987	14:54:08.79	.075	1240	5 Mar 1987	12:20:18.06	.072
1241	5 Mar 1987	00:25:15.45	.072	1242	5 Mar 1987	14:49:14.14	.072
1243	5 Mar 1987	08:14:54.66	.072	1244	27 Feb 1987	06:40:13.59	.071
1245	5 Mar 1987	15:05:31.54	.071	1246	5 Mar 1987	14:02:52.92	.071
1247	5 Mar 1987	09:00:57.95	.069	1248	5 Mar 1987	09:00:58.13	.069
1249	5 Mar 1987	01:09:42.41	.069	1250	5 Mar 1987	14:02:53.10	.069
1251	5 Mar 1987	18:01:59.08	.069	1252	5 Mar 1987	01:41:59.22	.068
1253	5 Mar 1987	17:56:33.55	.067	1254	27 Feb 1987	06:00:12.05	.067
1255	5 Mar 1987	01:41:38.78	.067	1256	5 Mar 1987	12:11:50.43	.066
1257	5 Mar 1987	08:14:54.71	.065	1258	27 Feb 1987	06:00:41.33	.065
1259	26 Feb 1987	19:38:26.44	.065	1260	5 Mar 1987	10:38:05.70	.064
1261	27 Feb 1987	05:25:37.30	.063	1262	27 Feb 1987	09:48:22.87	.062
1263	5 Mar 1987	17:56:33.68	.062	1264	5 Mar 1987	15:05:45.23	.061
1265	5 Mar 1987	12:08:42.46	.061	1266	5 Mar 1987	17:03:39.19	.059
1267	5 Mar 1987	00:51:01.19	.059	1268	5 Mar 1987	02:26:04.54	.059
1269	5 Mar 1987	15:05:50.89	.059	1270	26 Feb 1987	19:39:26.99	.059
1271	5 Mar 1987	14:01:13.31	.058	1272	5 Mar 1987	08:20:42.60	.057
1273	5 Mar 1987	13:46:34.21	.057	1274	27 Feb 1987	07:02:51.72	.056
1275	5 Mar 1987	17:53:12.93	.056	1276	27 Feb 1987	06:12:14.60	.056
1277	5 Mar 1987	02:24:33.21	.055	1278	27 Feb 1987	09:10:15.93	.055
1279	5 Mar 1987	12:26:35.38	.055	1280	5 Mar 1987	14:01:13.31	.055
1281	5 Mar 1987	11:34:34.09	.054	1282	5 Mar 1987	15:05:44.85	.054
1283	5 Mar 1987	17:03:31.13	.053	1284	5 Mar 1987	02:34:15.43	.053
1285	5 Mar 1987	14:54:08.69	.053	1286	5 Mar 1987	13:53:32.69	.052
1287	5 Mar 1987	02:25:57.01	.052	1288	27 Feb 1987	09:10:03.85	.052
1289	5 Mar 1987	11:20:29.33	.052	1290	5 Mar 1987	17:24:46.62	.051
1291	27 Feb 1987	09:47:41.82	.050	1292	5 Mar 1987	02:44:25.52	.050
1293	27 Feb 1987	07:04:47.13	.050	1294	5 Mar 1987	01:54:47.66	.050
1295	27 Feb 1987	09:13:21.21	.050	1296	5 Mar 1987	17:03:11.92	.049
1297	5 Mar 1987	08:20:42.64	.049	1298	27 Feb 1987	10:06:34.69	.048
1299	5 Mar 1987	02:34:15.39	.047	1300	5 Mar 1987	01:06:55.44	.046

FR 53.5	FR 59.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1301	5 Mar 1987	17:24:44.34	.046	1302	27 Feb 1987	07:10:45.35	.045
1303	5 Mar 1987	18:05:28.39	.045	1304	5 Mar 1987	02:26:04.76	.045
1305	5 Mar 1987	08:14:54.71	.044	1306	5 Mar 1987	14:45:18.36	.044
1307	5 Mar 1987	01:10:27.36	.044	1308	5 Mar 1987	02:06:19.17	.044
1309	5 Mar 1987	02:24:33.61	.044	1310	5 Mar 1987	13:26:34.66	.043
1311	5 Mar 1987	10:18:45.39	.043	1312	5 Mar 1987	02:49:59.81	.043
1313	5 Mar 1987	18:19:54.82	.042	1314	27 Feb 1987	06:03:37.15	.042
1315	5 Mar 1987	17:47:40.41	.040	1316	5 Mar 1987	08:27:15.35	.039
1317	5 Mar 1987	02:38:45.50	.039	1318	27 Feb 1987	05:28:07.66	.038
1319	27 Feb 1987	06:03:37.18	.038	1320	27 Feb 1987	08:42:12.76	.038
1321	5 Mar 1987	14:50:38.69	.037	1322	5 Mar 1987	00:45:37.76	.037
1323	5 Mar 1987	17:34:49.95	.036	1324	5 Mar 1987	15:05:47.32	.035
1325	27 Feb 1987	08:03:22.45	.035	1326	5 Mar 1987	00:30:43.58	.035
1327	5 Mar 1987	14:01:16.44	.035	1328	27 Feb 1987	10:05:35.66	.035
1329	5 Mar 1987	08:03:42.83	.034	1330	5 Mar 1987	02:05:53.97	.034
1331	27 Feb 1987	06:24:09.84	.034	1332	5 Mar 1987	02:38:45.40	.033
1333	27 Feb 1987	09:38:34.62	.033	1334	5 Mar 1987	10:18:37.07	.033
1335	26 Feb 1987	19:47:02.06	.032	1336	5 Mar 1987	07:36:12.39	.032
1337	5 Mar 1987	10:22:24.93	.032	1338	5 Mar 1987	08:03:42.89	.031
1339	5 Mar 1987	00:30:43.58	.031	1340	5 Mar 1987	01:41:38.76	.031
1341	5 Mar 1987	13:07:40.05	.031	1342	5 Mar 1987	17:34:44.04	.031
1343	26 Feb 1987	19:19:38.76	.030	1344	27 Feb 1987	09:47:23.07	.030
1345	5 Mar 1987	01:57:30.79	.030	1346	5 Mar 1987	14:49:14.17	.030
1347	5 Mar 1987	11:17:17.84	.030	1348	5 Mar 1987	08:52:32.09	.030
1349	5 Mar 1987	17:47:42.50	.029	1350	5 Mar 1987	08:05:35.40	.029
1351	27 Feb 1987	09:59:07.09	.029	1352	5 Mar 1987	08:27:15.35	.028
1353	5 Mar 1987	00:32:36.64	.028	1354	5 Mar 1987	08:20:42.51	.028
1355	5 Mar 1987	02:34:15.39	.027	1356	27 Feb 1987	07:13:54.75	.027
1357	5 Mar 1987	12:36:49.49	.027	1358	5 Mar 1987	15:05:47.74	.027
1359	26 Feb 1987	18:36:43.18	.027	1360	26 Feb 1987	19:46:31.67	.026
1361	5 Mar 1987	08:53:10.21	.026	1362	5 Mar 1987	10:18:45.58	.026
1363	5 Mar 1987	17:51:17.12	.026	1364	27 Feb 1987	09:57:35.55	.026
1365	5 Mar 1987	14:02:52.92	.025	1366	27 Feb 1987	06:22:55.68	.025
1367	27 Feb 1987	04:50:44.07	.025	1368	5 Mar 1987	08:20:42.60	.025
1369	5 Mar 1987	17:24:44.71	.024	1370	5 Mar 1987	02:09:16.17	.024
1371	5 Mar 1987	01:10:27.36	.024	1372	27 Feb 1987	08:05:04.81	.023
1373	5 Mar 1987	17:44:47.63	.023	1374	5 Mar 1987	08:20:42.60	.023
1375	5 Mar 1987	02:53:30.79	.023	1376	5 Mar 1987	17:34:46.52	.023
1377	27 Feb 1987	06:22:55.50	.023	1378	5 Mar 1987	07:32:19.93	.022
1379	5 Mar 1987	02:10:55.04	.022	1380	27 Feb 1987	10:02:13.00	.022
1381	27 Feb 1987	08:20:02.84	.022	1382	27 Feb 1987	09:14:28.38	.022
1383	5 Mar 1987	07:47:36.49	.022	1384	5 Mar 1987	02:24:05.40	.021
1385	5 Mar 1987	08:20:23.95	.021	1386	5 Mar 1987	01:13:17.87	.021
1387	5 Mar 1987	08:04:04.54	.021	1388	5 Mar 1987	07:35:14.59	.021
1389	5 Mar 1987	02:53:54.01	.020	1390	5 Mar 1987	17:11:38.12	.020
1391	5 Mar 1987	00:32:36.64	.020	1392	5 Mar 1987	00:32:36.64	.020
1393	5 Mar 1987	08:55:05.82	.020	1394	5 Mar 1987	17:34:33.81	.020
1395	5 Mar 1987	08:14:54.75	.020	1396	27 Feb 1987	07:12:54.71	.020
1397	27 Feb 1987	06:12:14.58	.019	1398	5 Mar 1987	08:57:27.17	.019
1399	5 Mar 1987	01:55:13.13	.019	1400	27 Feb 1987	09:47:41.82	.019
1401	5 Mar 1987	07:41:24.21	.018	1402	5 Mar 1987	07:32:20.18	.018
1403	27 Feb 1987	09:46:23.21	.018	1404	5 Mar 1987	00:58:56.16	.018
1405	5 Mar 1987	00:59:24.84	.018	1406	5 Mar 1987	01:49:44.16	.018
1407	27 Feb 1987	05:27:30.10	.018	1408	27 Feb 1987	08:41:46.31	.018
1409	5 Mar 1987	17:11:38.11	.017	1410	5 Mar 1987	07:47:53.61	.017
1411	5 Mar 1987	08:19:29.02	.017	1412	5 Mar 1987	17:34:33.81	.017
1413	5 Mar 1987	14:01:13.31	.017	1414	27 Feb 1987	08:19:51.65	.017
1415	27 Feb 1987	07:12:54.72	.017	1416	5 Mar 1987	17:11:40.69	.017
1417	5 Mar 1987	08:16:09.64	.016	1418	27 Feb 1987	08:31:14.93	.016
1419	5 Mar 1987	14:49:37.87	.016	1420	5 Mar 1987	00:47:29.84	.016
1421	5 Mar 1987	02:51:23.47	.016	1422	5 Mar 1987	17:03:39.52	.016
1423	26 Feb 1987	18:28:38.08	.015	1424	5 Mar 1987	17:02:06.98	.015
1425	5 Mar 1987	02:26:04.57	.015	1426	27 Feb 1987	09:48:05.45	.015
1427	5 Mar 1987	08:57:27.17	.014	1428	5 Mar 1987	17:34:46.52	.013
1429	5 Mar 1987	17:34:46.63	.013	1430	5 Mar 1987	09:00:57.99	.013

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1431	5 Mar	1987 08:20:25.75	.013	1432	5 Mar	1987 17:2[illegible]:37.75	.013
1433	5 Mar	1987 08:47:56.11	.013	1434	5 Mar	1987 17:30:36.98	.013
1435	27 Feb	1987 10:12:46.94	.012	1436	5 Mar	1987 14:02:52.92	.012
1437	5 Mar	1987 00:34:41.48	.012	1438	5 Mar	1987 01:03:14.46	.012
1439	5 Mar	1987 08:52:27.74	.012	1440	27 Feb	1987 10:17:45.59	.011
1441	5 Mar	1987 00:32:36.64	.011	1442	27 Feb	1987 08:14:49.25	.011
1443	5 Mar	1987 02:27:50.16	.011	1444	5 Mar	1987 02:34:44.95	.011
1445	5 Mar	1987 10:09:44.56	.011	1446	5 Mar	1987 02:51:18.79	.011
1447	5 Mar	1987 08:20:42.51	.011	1448	5 Mar	1987 17:47:42.52	.010
1449	26 Feb	1987 18:27:00.62	.010	1450	5 Mar	1987 17:11:38.11	.010
1451	5 Mar	1987 17:03:31.14	.010	1452	5 Mar	1987 02:34:40.87	.010
1453	5 Mar	1987 02:43:03.27	.010	1454	5 Mar	1987 09:01:24.66	.010
1455	5 Mar	1987 00:36:51.78	.010	1456	5 Mar	1987 02:46:50.66	.010
1457	27 Feb	1987 10:17:45.59	.010	1458	5 Mar	1987 01:17:28.35	.009
1459	5 Mar	1987 10:14:15.19	.009	1460	5 Mar	1987 00:35:36.39	.009
1461	5 Mar	1987 14:58:01.75	.009	1462	5 Mar	1987 00:35:36.68	.009
1463	27 Feb	1987 05:45:21.72	.009	1464	5 Mar	1987 15:00:31.52	.008
1465	27 Feb	1987 07:13:23.33	.008	1466	27 Feb	1987 10:17:45.59	.008
1467	5 Mar	1987 02:51:18.81	.008	1468	5 Mar	1987 09:01:00.34	.008
1469	5 Mar	1987 01:05:39.59	.008	1470	5 Mar	1987 00:47:29.84	.008
1471	27 Feb	1987 05:01:26.12	.008	1472	5 Mar	1987 01:55:12.13	.008
1473	5 Mar	1987 02:34:40.87	.008	1474	5 Mar	1987 17:24:44.64	.008
1475	5 Mar	1987 17:30:36.98	.008	1476	5 Mar	1987 17:03:31.14	.008
1477	5 Mar	1987 07:54:56.75	.007	1478	5 Mar	1987 14:02:52.92	.007
1479	5 Mar	1987 02:24:07.11	.007	1480	5 Mar	1987 15:00:31.52	.007
1481	5 Mar	1987 01:01:02.45	.007	1482	5 Mar	1987 17:21:07.75	.007
1483	5 Mar	1987 02:49:59.81	.007	1484	5 Mar	1987 15:00:31.52	.007
1485	5 Mar	1987 00:53:43.72	.007	1486	5 Mar	1987 08:19:35.90	.007
1487	5 Mar	1987 08:19:35.90	.007	1488	27 Feb	1987 08:19:51.56	.006
1489	5 Mar	1987 02:34:41.07	.006	1490	27 Feb	1987 08:35:01.36	.006
1491	5 Mar	1987 00:34:41.48	.006	1492	5 Mar	1987 08:31:12.42	.006
1493	5 Mar	1987 00:31:00.11	.006	1494	5 Mar	1987 07:47:32.79	.006
1495	5 Mar	1987 12:33:47.91	.006	1496	5 Mar	1987 12:48:39.92	.006
1497	5 Mar	1987 17:19:04.06	.006	1498	5 Mar	1987 17:19:04.06	.005
1499	5 Mar	1987 00:59:24.84	.005	1500	5 Mar	1987 01:15:35.32	.005
1501	27 Feb	1987 04:45:09.21	.005	1502	5 Mar	1987 01:06:28.24	.005
1503	5 Mar	1987 02:34:41.12	.005	1504	27 Feb	1987 08:56:28.32	.005
1505	5 Mar	1987 01:06:28.24	.005	1506	5 Mar	1987 17:19:04.13	.005
1507	26 Feb	1987 19:46:23.81	.005	1508	27 Feb	1987 05:29:09.13	.005
1509	5 Mar	1987 08:19:35.90	.005	1510	5 Mar	1987 17:19:04.88	.005
1511	5 Mar	1987 08:05:35.40	.005	1512	5 Mar	1987 14:23:27.19	.005
1513	5 Mar	1987 17:19:04.88	.005	1514	5 Mar	1987 00:32:36.64	.005
1515	5 Mar	1987 17:34:39.52	.005	1516	5 Mar	1987 09:01:13.08	.005
1517	5 Mar	1987 17:19:04.88	.005	1518	5 Mar	1987 01:15:35.32	.005
1519	5 Mar	1987 01:15:35.65	.005	1520	5 Mar	1987 01:12:44.36	.004
1521	5 Mar	1987 17:47:39.73	.004	1522	5 Mar	1987 08:00:50.50	.004
1523	5 Mar	1987 17:19:04.88	.004	1524	5 Mar	1987 07:32:44.93	.004
1525	5 Mar	1987 17:34:43.85	.004	1526	5 Mar	1987 02:09:16.17	.004
1527	5 Mar	1987 08:19:37.60	.004	1528	5 Mar	1987 01:13:17.87	.004
1529	5 Mar	1987 00:47:29.84	.004	1530	5 Mar	1987 17:12:42.25	.004
1531	5 Mar	1987 17:34:38.03	.004	1532	5 Mar	1987 17:19:04.13	.003
1533	5 Mar	1987 17:34:39.50	.003	1534	5 Mar	1987 00:51:01.19	.003
1535	5 Mar	1987 00:35:36.40	.003	1536	5 Mar	1987 00:59:24.84	.003
1537	5 Mar	1987 07:47:32.79	.003	1538	5 Mar	1987 17:24:44.65	.003
1539	27 Feb	1987 08:05:04.81	.003	1540	5 Mar	1987 17:24:44.47	.003
1541	5 Mar	1987 08:19:36.43	.003	1542	5 Mar	1987 00:59:24.84	.002
1543	5 Mar	1987 17:34:44.04	.002	1544	5 Mar	1987 17:19:04.55	.002
1545	5 Mar	1987 17:21:07.75	.002	1546	5 Mar	1987 14:50:56.12	.002
1547	27 Feb	1987 08:04:18.04	.002	1548	5 Mar	1987 00:59:24.84	.002
1549	5 Mar	1987 00:37:48.33	.002	1550	5 Mar	1987 17:19:04.88	.002
1551	5 Mar	1987 18:06:48.83	.002	1552	5 Mar	1987 07:47:32.79	.002
1553	5 Mar	1987 01:07:43.12	.002	1554	5 Mar	1987 00:31:08.73	.002
1555	5 Mar	1987 07:47:26.85	.002	1556	5 Mar	1987 00:37:48.33	.001
1557	5 Mar	1987 17:47:42.52	.001	1558	5 Mar	1987 00:35:36.49	.001
1559	26 Feb	1987 18:48:59.28	0.000	1560	5 Mar	1987 00:59:24.84	-0.000

FR 53.5	FR 50.0	FR 50.5	FR 51.0	FR 51.5	FR 52.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1561	5 Mar 1987	17:11:38.18	-.001	1562	5 Mar 1987	17:24:50.64	-.002
1563	26 Feb 1987	18:36:22.80	-.002	1564	26 Feb 1987	18:28:12.87	-.010
1565	26 Feb 1987	19:29:38.41	-.028	1566	27 Feb 1987	04:55:52.37	-.036
1567	26 Feb 1987	19:20:02.68	-.053	1568	26 Feb 1987	18:59:26.45	-.083

PRESSURE STATISTICS
ON ALL 'GOOD' PANELS ABOVE THE
STRINGER WITH EACH PANEL TAKEN
SEPARATELY (RANKING THE PEAK VALUE
FOR EACH EIGHT MINUTE WINDOW)

All Panels have been taken as an individual event

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.250	135	34.4
2	.250	.500	88	22.4
3	.500	.750	64	16.3
4	.750	1.000	47	12.0
5	1.000	1.250	25	6.4
6	1.250	1.500	11	2.8
7	1.500	1.750	11	2.8
8	1.750	2.000	4	1.0
9	2.000	2.250	3	.8
10	2.250	2.500	0	0.0
11	2.500	2.750	2	.5
Total			390	99.5

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	5 Mar 1987	10:46:48.48	2.668	2	5 Mar 1987	02:06:48.61	2.567
3	27 Feb 1987	08:00:50.21	2.202	4	5 Mar 1987	17:24:44.70	2.179
5	5 Mar 1987	11:05:46.13	2.137	6	27 Feb 1987	06:15:25.58	1.989
7	5 Mar 1987	01:47:21.46	1.951	8	5 Mar 1987	12:27:39.57	1.950
9	27 Feb 1987	06:03:08.36	1.773	10	5 Mar 1987	01:14:30.54	1.712
11	5 Mar 1987	17:24:44.61	1.704	12	5 Mar 1987	10:38:56.16	1.688
13	5 Mar 1987	10:36:45.82	1.682	14	5 Mar 1987	12:59:19.24	1.627
15	27 Feb 1987	06:15:25.67	1.605	16	5 Mar 1987	10:10:01.00	1.587
17	5 Mar 1987	11:40:24.63	1.573	18	26 Feb 1987	18:58:03.59	1.554
19	5 Mar 1987	02:01:08.85	1.541	20	27 Feb 1987	07:43:50.96	1.531
21	26 Feb 1987	18:51:30.20	1.489	22	5 Mar 1987	14:35:36.19	1.433
23	25 Feb 1987	07:27:56.82	1.419	24	5 Mar 1987	07:53:52.32	1.404
25	5 Mar 1987	12:26:35.30	1.372	26	5 Mar 1987	00:32:36.67	1.336
27	5 Mar 1987	12:38:57.36	1.334	28	5 Mar 1987	13:48:25.89	1.299
29	5 Mar 1987	11:43:32.88	1.295	30	5 Mar 1987	01:13:17.84	1.259
31	5 Mar 1987	08:52:27.67	1.252	32	26 Feb 1987	18:20:45.60	1.236
33	5 Mar 1987	02:03:30.85	1.236	34	27 Feb 1987	07:50:55.07	1.230
35	5 Mar 1987	10:18:18.03	1.215	36	27 Feb 1987	07:38:34.84	1.214
37	5 Mar 1987	10:58:04.81	1.190	38	5 Mar 1987	02:01:10.11	1.180
39	5 Mar 1987	12:38:16.86	1.178	40	27 Feb 1987	09:42:57.64	1.173
41	5 Mar 1987	10:36:45.93	1.172	42	5 Mar 1987	12:46:31.91	1.164
43	5 Mar 1987	14:35:20.67	1.155	44	5 Mar 1987	08:34:29.93	1.111
45	26 Feb 1987	19:19:27.18	1.099	46	5 Mar 1987	13:32:51.25	1.079
47	27 Feb 1987	07:37:10.35	1.069	48	5 Mar 1987	01:41:28.85	1.063
49	5 Mar 1987	08:55:05.82	1.054	50	5 Mar 1987	11:09:53.36	1.046
51	5 Mar 1987	10:23:56.11	1.028	52	5 Mar 1987	14:27:14.08	1.025
53	5 Mar 1987	17:57:26.28	1.017	54	5 Mar 1987	17:53:30.72	1.011
55	5 Mar 1987	13:09:52.57	1.001	56	5 Mar 1987	12:45:07.15	1.001
57	5 Mar 1987	11:24:50.75	.996	58	27 Feb 1987	07:50:55.13	.986
59	5 Mar 1987	12:05:24.72	.968	60	5 Mar 1987	13:09:51.91	.959
61	5 Mar 1987	13:27:13.12	.958	62	5 Mar 1987	00:32:36.67	.958
63	5 Mar 1987	10:29:01.89	.943	64	5 Mar 1987	13:34:59.07	.940
65	5 Mar 1987	13:37:24.57	.938	66	5 Mar 1987	07:54:31.89	.938
67	27 Feb 1987	04:44:21.40	.938	68	5 Mar 1987	12:59:56.64	.934
69	5 Mar 1987	14:30:40.70	.928	70	5 Mar 1987	13:25:27.14	.928
71	5 Mar 1987	14:43:41.03	.925	72	27 Feb 1987	05:42:23.36	.889
73	5 Mar 1987	17:46:02.29	.884	74	27 Feb 1987	05:57:26.64	.881
75	5 Mar 1987	12:34:13.32	.880	76	26 Feb 1987	18:25:24.84	.878
77	5 Mar 1987	12:18:41.49	.873	78	5 Mar 1987	14:46:47.37	.873
79	5 Mar 1987	13:27:20.48	.866	80	5 Mar 1987	12:47:11.02	.859
81	26 Feb 1987	19:47:01.70	.857	82	5 Mar 1987	12:05:41.32	.853
83	5 Mar 1987	14:17:08.25	.850	84	5 Mar 1987	12:21:57.49	.845
85	5 Mar 1987	12:41:16.96	.831	86	5 Mar 1987	14:43:21.08	.830
87	27 Feb 1987	04:45:07.56	.826	88	5 Mar 1987	13:04:20.92	.824
89	26 Feb 1987	19:26:37.03	.819	90	5 Mar 1987	13:08:44.07	.815
91	5 Mar 1987	12:08:36.61	.811	92	5 Mar 1987	10:09:22.61	.809
93	5 Mar 1987	11:35:22.61	.802	94	26 Feb 1987	18:40:46.03	.799
95	5 Mar 1987	11:30:02.48	.796	96	5 Mar 1987	10:52:54.55	.794
97	27 Feb 1987	07:09:02.93	.792	98	5 Mar 1987	10:56:12.44	.785
99	5 Mar 1987	13:54:50.57	.769	100	5 Mar 1987	02:13:12.05	.766
101	26 Feb 1987	19:47:01.67	.761	102	5 Mar 1987	12:18:21.83	.757
103	5 Mar 1987	14:42:37.25	.757	104	27 Feb 1987	05:29:05.83	.739
105	5 Mar 1987	11:22:37.23	.737	106	5 Mar 1987	12:08:37.50	.735
107	5 Mar 1987	12:59:32.06	.730	108	27 Feb 1987	08:42:59.75	.709
109	5 Mar 1987	11:43:32.88	.697	110	27 Feb 1987	05:54:58.74	.696
111	5 Mar 1987	02:09:04.12	.695	112	5 Mar 1987	00:35:36.45	.692
113	5 Mar 1987	07:47:53.57	.690	114	5 Mar 1987	17:51:51.70	.688
115	5 Mar 1987	14:49:41.79	.681	116	5 Mar 1987	13:51:59.15	.679
117	5 Mar 1987	17:47:43.03	.678	118	26 Feb 1987	18:45:49.21	.676
119	26 Feb 1987	19:47:15.72	.673	120	5 Mar 1987	01:50:31.12	.671
121	26 Feb 1987	19:14:56.08	.666	122	5 Mar 1987	18:20:19.80	.663
123	5 Mar 1987	13:23:14.30	.659	124	5 Mar 1987	11:22:37.23	.657
125	26 Feb 1987	19:41:33.27	.653	126	5 Mar 1987	11:04:42.03	.647
127	27 Feb 1987	08:24:53.59	.647	128	27 Feb 1987	08:48:17.30	.646
129	5 Mar 1987	08:55:05.81	.642	130	5 Mar 1987	17:47:39.68	.638

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
131	27 Feb 1987	09:05:57.96	.631	132	26 Feb 1987	18:34:48.87	.626
133	26 Feb 1987	19:39:29.74	.625	134	5 Mar 1987	11:09:53.10	.624
135	27 Feb 1987	04:53:52.75	.616	136	5 Mar 1987	11:06:57.65	.616
137	5 Mar 1987	01:40:39.98	.615	138	5 Mar 1987	10:51:26.45	.613
139	5 Mar 1987	11:31:24.03	.612	140	5 Mar 1987	10:04:49.17	.610
141	5 Mar 1987	18:22:22.20	.605	142	5 Mar 1987	18:14:12.75	.603
143	5 Mar 1987	11:35:21.70	.599	144	27 Feb 1987	08:17:47.80	.594
145	5 Mar 1987	17:03:39.45	.588	146	5 Mar 1987	17:47:39.63	.588
147	5 Mar 1987	10:47:59.68	.588	148	5 Mar 1987	18:04:06.90	.586
149	5 Mar 1987	01:41:18.86	.580	150	5 Mar 1987	14:16:05.91	.578
151	27 Feb 1987	07:59:29.92	.574	152	5 Mar 1987	17:55:34.58	.569
153	27 Feb 1987	10:08:27.45	.567	154	26 Feb 1987	18:30:54.91	.564
155	5 Mar 1987	09:00:51.55	.557	156	27 Feb 1987	08:23:53.99	.555
157	5 Mar 1987	10:02:55.36	.550	158	27 Feb 1987	10:20:20.79	.548
159	5 Mar 1987	18:20:30.61	.548	160	5 Mar 1987	10:42:25.26	.547
161	5 Mar 1987	18:13:08.98	.543	162	5 Mar 1987	18:20:03.59	.524
163	27 Feb 1987	09:48:12.35	.521	164	5 Mar 1987	02:43:09.18	.514
165	5 Mar 1987	10:38:56.23	.506	166	5 Mar 1987	02:39:57.61	.502
167	5 Mar 1987	07:32:34.99	.500	168	27 Feb 1987	06:25:45.13	.500
169	27 Feb 1987	08:24:53.61	.496	170	5 Mar 1987	11:09:53.15	.496
171	5 Mar 1987	10:28:43.41	.495	172	27 Feb 1987	08:51:28.20	.491
173	27 Feb 1987	08:03:39.72	.488	174	27 Feb 1987	07:41:36.62	.486
175	5 Mar 1987	02:34:30.40	.485	176	5 Mar 1987	14:25:05.07	.473
177	5 Mar 1987	08:02:40.32	.472	178	5 Mar 1987	11:40:24.61	.472
179	26 Feb 1987	18:15:23.26	.467	180	5 Mar 1987	14:14:47.09	.464
181	5 Mar 1987	08:04:04.54	.463	182	5 Mar 1987	12:22:14.65	.462
183	27 Feb 1987	09:05:12.05	.459	184	27 Feb 1987	06:25:18.75	.455
185	25 Feb 1987	07:26:24.08	.453	186	27 Feb 1987	09:02:41.99	.452
187	5 Mar 1987	18:01:59.16	.450	188	27 Feb 1987	08:56:03.51	.446
189	27 Feb 1987	07:55:51.37	.442	190	27 Feb 1987	08:56:28.29	.439
191	5 Mar 1987	07:47:51.13	.439	192	5 Mar 1987	02:51:46.97	.438
193	5 Mar 1987	07:55:08.43	.434	194	5 Mar 1987	17:24:44.34	.432
195	27 Feb 1987	09:15:02.10	.418	196	26 Feb 1987	18:59:09.17	.418
197	5 Mar 1987	14:35:20.41	.402	198	5 Mar 1987	18:10:12.84	.402
199	26 Feb 1987	18:16:55.68	.395	200	5 Mar 1987	02:10:51.42	.395
201	5 Mar 1987	14:01:13.31	.394	202	26 Feb 1987	18:40:22.86	.393
203	5 Mar 1987	02:50:50.90	.392	204	27 Feb 1987	10:19:55.28	.389
205	5 Mar 1987	14:04:05.98	.388	206	5 Mar 1987	10:12:28.83	.384
207	5 Mar 1987	10:29:02.06	.380	208	5 Mar 1987	12:59:19.24	.378
209	5 Mar 1987	02:25:57.01	.377	210	5 Mar 1987	02:10:49.70	.376
211	5 Mar 1987	18:15:32.74	.369	212	5 Mar 1987	07:36:03.96	.368
213	27 Feb 1987	06:01:43.48	.366	214	5 Mar 1987	00:51:01.19	.362
215	5 Mar 1987	13:46:05.43	.356	216	27 Feb 1987	04:51:44.99	.354
217	5 Mar 1987	13:48:25.91	.348	218	27 Feb 1987	07:34:51.67	.348
219	5 Mar 1987	10:18:18.09	.346	220	5 Mar 1987	02:34:46.47	.345
221	27 Feb 1987	07:05:01.19	.345	222	5 Mar 1987	10:12:28.82	.340
223	26 Feb 1987	19:23:45.17	.331	224	27 Feb 1987	09:40:05.50	.331
225	26 Feb 1987	18:24:49.33	.329	226	26 Feb 1987	18:57:27.41	.323
227	27 Feb 1987	07:46:50.54	.319	228	27 Feb 1987	07:10:14.18	.319
229	5 Mar 1987	11:09:53.38	.316	230	5 Mar 1987	13:57:34.80	.313
231	5 Mar 1987	12:47:11.11	.311	232	27 Feb 1987	10:15:52.45	.308
233	5 Mar 1987	17:03:19.20	.306	234	5 Mar 1987	11:25:46.77	.304
235	26 Feb 1987	19:46:39.03	.300	236	27 Feb 1987	08:50:38.10	.294
237	25 Feb 1987	07:26:24.11	.294	238	26 Feb 1987	18:27:27.10	.283
239	26 Feb 1987	19:19:06.34	.281	240	27 Feb 1987	08:42:57.84	.278
241	5 Mar 1987	09:01:10.67	.277	242	5 Mar 1987	08:15:13.01	.277
243	27 Feb 1987	09:12:29.77	.276	244	5 Mar 1987	11:05:46.13	.276
245	26 Feb 1987	18:46:54.42	.268	246	5 Mar 1987	08:05:54.64	.268
247	26 Feb 1987	19:39:11.32	.266	248	5 Mar 1987	14:49:37.87	.263
249	27 Feb 1987	06:44:52.92	.261	250	26 Feb 1987	19:13:01.47	.260
251	5 Mar 1987	00:31:00.11	.257	252	5 Mar 1987	18:04:13.15	.256
253	26 Feb 1987	19:25:19.24	.256	254	26 Feb 1987	18:16:12.84	.255
255	5 Mar 1987	12:24:58.04	.252	256	27 Feb 1987	05:48:24.06	.250
257	27 Feb 1987	09:43:32.96	.247	258	25 Feb 1987	07:27:59.31	.245
259	27 Feb 1987	04:55:29.09	.244	260	5 Mar 1987	14:25:32.07	.241

FR 53.5	FR 60.0	FR 60.5	FR 51.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
261	27 Feb 1987	06:25:18.79	.241	262	5 Mar 1987	08:33:50.74	.240
263	26 Feb 1987	18:46:26.94	.237	264	27 Feb 1987	08:03:39.72	.233
265	5 Mar 1987	17:34:45.90	.231	266	5 Mar 1987	00:45:27.39	.230
267	5 Mar 1987	01:54:47.68	.228	268	5 Mar 1987	02:53:54.01	.227
269	5 Mar 1987	02:43:09.18	.222	270	27 Feb 1987	10:05:35.66	.220
271	27 Feb 1987	07:04:47.13	.218	272	27 Feb 1987	04:46:06.97	.213
273	5 Mar 1987	14:26:24.28	.212	274	27 Feb 1987	05:54:58.74	.212
275	5 Mar 1987	01:14:30.54	.206	276	5 Mar 1987	13:46:14.04	.205
277	5 Mar 1987	08:16:00.32	.198	278	27 Feb 1987	05:28:09.47	.197
279	27 Feb 1987	07:04:01.09	.196	280	5 Mar 1987	07:55:08.49	.195
281	27 Feb 1987	05:56:56.80	.195	282	5 Mar 1987	01:09:42.40	.194
283	5 Mar 1987	08:33:50.74	.192	284	26 Feb 1987	18:59:09.17	.192
285	27 Feb 1987	04:59:43.82	.192	286	27 Feb 1987	09:10:15.93	.184
287	27 Feb 1987	06:15:25.41	.183	288	5 Mar 1987	02:54:14.62	.180
289	27 Feb 1987	09:57:55.63	.179	290	5 Mar 1987	01:00:13.06	.178
291	5 Mar 1987	17:24:44.29	.176	292	5 Mar 1987	14:11:31.41	.173
293	26 Feb 1987	19:22:44.35	.171	294	5 Mar 1987	00:37:11.35	.169
295	5 Mar 1987	17:03:03.14	.169	296	5 Mar 1987	02:34:41.07	.166
297	27 Feb 1987	07:56:02.45	.165	298	26 Feb 1987	19:41:36.70	.163
299	5 Mar 1987	14:49:38.09	.152	300	5 Mar 1987	02:24:17.64	.149
301	5 Mar 1987	00:51:01.59	.146	302	27 Feb 1987	04:56:22.32	.144
303	5 Mar 1987	13:34:59.07	.142	304	5 Mar 1987	02:24:07.89	.141
305	5 Mar 1987	00:35:36.49	.140	306	5 Mar 1987	08:52:27.67	.136
307	27 Feb 1987	08:36:18.93	.135	308	27 Feb 1987	06:41:27.62	.134
309	5 Mar 1987	07:47:26.75	.131	310	27 Feb 1987	06:15:25.41	.130
311	5 Mar 1987	10:46:48.58	.129	312	27 Feb 1987	06:42:28.63	.126
313	5 Mar 1987	08:30:39.97	.126	314	27 Feb 1987	10:16:12.06	.124
315	5 Mar 1987	08:14:55.50	.122	316	5 Mar 1987	15:05:47.06	.121
317	27 Feb 1987	06:25:45.13	.121	318	5 Mar 1987	08:15:13.32	.120
319	27 Feb 1987	05:26:07.32	.120	320	27 Feb 1987	10:10:28.73	.117
321	5 Mar 1987	14:02:43.37	.116	322	5 Mar 1987	07:32:41.82	.113
323	5 Mar 1987	07:36:03.96	.112	324	27 Feb 1987	06:00:41.21	.108
325	27 Feb 1987	09:57:36.93	.107	326	5 Mar 1987	17:03:34.14	.105
327	5 Mar 1987	09:01:13.08	.105	328	5 Mar 1987	15:05:47.74	.105
329	27 Feb 1987	05:48:24.06	.098	330	5 Mar 1987	02:39:00.61	.098
331	5 Mar 1987	01:13:17.84	.096	332	27 Feb 1987	06:44:54.11	.092
333	27 Feb 1987	09:02:41.99	.092	334	5 Mar 1987	17:34:34.30	.091
335	5 Mar 1987	07:47:06.25	.090	336	5 Mar 1987	01:00:13.06	.087
337	27 Feb 1987	09:47:23.07	.085	338	27 Feb 1987	08:24:53.61	.085
339	27 Feb 1987	08:34:45.73	.085	340	27 Feb 1987	09:43:32.96	.083
341	27 Feb 1987	08:15:26.17	.078	342	5 Mar 1987	01:10:37.74	.078
343	5 Mar 1987	13:54:50.57	.076	344	5 Mar 1987	00:25:15.45	.072
345	5 Mar 1987	01:09:42.41	.069	346	5 Mar 1987	18:01:59.08	.069
347	27 Feb 1987	06:00:12.05	.067	348	5 Mar 1987	00:51:01.19	.059
349	5 Mar 1987	15:05:50.89	.059	350	5 Mar 1987	14:01:13.31	.058
351	27 Feb 1987	09:10:15.93	.055	352	5 Mar 1987	12:26:35.38	.055
353	5 Mar 1987	02:25:57.01	.052	354	27 Feb 1987	07:04:47.13	.050
355	5 Mar 1987	01:54:47.66	.050	356	5 Mar 1987	01:06:55.44	.046
357	27 Feb 1987	07:10:45.35	.045	358	5 Mar 1987	08:27:15.35	.039
359	27 Feb 1987	08:03:22.45	.035	360	27 Feb 1987	10:05:35.66	.035
361	27 Feb 1987	09:47:23.07	.030	362	5 Mar 1987	15:05:47.74	.027
363	27 Feb 1987	09:57:35.55	.026	364	27 Feb 1987	10:02:13.00	.022
365	5 Mar 1987	08:20:23.95	.021	366	5 Mar 1987	08:04:04.54	.021
367	5 Mar 1987	17:34:33.81	.020	368	5 Mar 1987	08:57:27.17	.019
369	5 Mar 1987	00:59:24.84	.018	370	5 Mar 1987	01:49:44.16	.018
371	27 Feb 1987	08:41:46.31	.018	372	5 Mar 1987	17:11:38.11	.017
373	5 Mar 1987	08:19:29.02	.017	374	5 Mar 1987	17:34:33.81	.017
375	27 Feb 1987	08:31:14.93	.016	376	5 Mar 1987	14:49:37.87	.016
377	27 Feb 1987	09:48:05.45	.015	378	5 Mar 1987	08:20:25.75	.013
379	27 Feb 1987	08:14:49.25	.011	380	5 Mar 1987	02:27:50.16	.011
381	5 Mar 1987	00:36:51.78	.010	382	27 Feb 1987	05:45:21.72	.009
383	27 Feb 1987	07:13:23.33	.008	384	5 Mar 1987	01:01:02.45	.007
385	27 Feb 1987	08:19:51.56	.006	386	27 Feb 1987	08:35:01.36	.006
387	27 Feb 1987	05:29:09.13	.005	388	5 Mar 1987	17:19:04.13	.003
389	27 Feb 1987	08:05:04.81	.003	390	5 Mar 1987	17:19:04.55	.002

FR 53.5	FR 52.0	FR 50.5	FR 51.0	FR 51.5	FR 52.0
Used	Not Used	Not Used	Not Used	Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
391	5 Mar	1987 17:11:38.18	-.001	392	26 Feb	1987 18:36:22.80	-.002

PRESSURE STATISTICS
ON ALL 'GOOD' PANELS ON THE
STRINGER WITH EACH PANEL TAKEN
SEPARATELY (RANKING THE PEAK VALUE
FOR EACH EIGHT MINUTE WINDOW)

All Panels have been taken as an individual event

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Not used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.250	96	49.0
2	.250	.500	77	39.3
3	.500	.750	15	7.7
4	.750	1.000	1	.5
5	1.000	1.250	1	.5
6	1.250	1.500	1	.5
7	1.500	1.750	1	.5
Total			192	98.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	25 Feb 1987	07:28:54.11	1.644	2	27 Feb 1987	09:39:27.79	1.273
3	5 Mar 1987	08:52:27.74	1.247	4	27 Feb 1987	07:12:54.72	.822
5	5 Mar 1987	17:47:42.59	.740	6	27 Feb 1987	08:21:55.52	.730
7	5 Mar 1987	14:35:36.19	.651	8	5 Mar 1987	11:45:19.64	.620
9	5 Mar 1987	11:36:06.02	.614	10	5 Mar 1987	11:11:25.73	.592
11	27 Feb 1987	09:06:40.56	.578	12	27 Feb 1987	07:02:51.71	.570
13	5 Mar 1987	17:56:33.84	.565	14	5 Mar 1987	13:04:06.50	.562
15	5 Mar 1987	13:29:28.49	.549	16	5 Mar 1987	01:13:17.84	.548
17	27 Feb 1987	07:02:51.72	.535	18	5 Mar 1987	10:36:45.82	.531
19	5 Mar 1987	12:26:35.30	.527	20	5 Mar 1987	01:55:12.21	.499
21	5 Mar 1987	07:56:20.36	.497	22	27 Feb 1987	05:01:26.06	.495
23	27 Feb 1987	07:50:55.07	.484	24	5 Mar 1987	11:04:11.60	.469
25	27 Feb 1987	06:23:26.39	.468	26	5 Mar 1987	18:01:38.92	.460
27	27 Feb 1987	07:46:22.94	.458	28	27 Feb 1987	07:59:32.70	.453
29	5 Mar 1987	17:53:30.72	.453	30	5 Mar 1987	10:45:29.08	.451
31	5 Mar 1987	10:29:01.89	.439	32	5 Mar 1987	02:03:30.85	.438
33	5 Mar 1987	12:05:24.72	.437	34	27 Feb 1987	09:43:10.13	.429
35	5 Mar 1987	14:46:47.37	.424	36	27 Feb 1987	05:45:21.91	.424
37	5 Mar 1987	12:17:43.00	.418	38	5 Mar 1987	13:33:27.09	.413
39	5 Mar 1987	14:17:08.25	.410	40	5 Mar 1987	10:24:46.30	.405
41	5 Mar 1987	11:04:11.40	.401	42	27 Feb 1987	05:54:02.43	.389
43	5 Mar 1987	00:32:36.75	.383	44	26 Feb 1987	18:36:42.49	.383
45	5 Mar 1987	11:19:52.03	.377	46	5 Mar 1987	14:33:03.80	.377
47	5 Mar 1987	12:43:51.82	.373	48	27 Feb 1987	08:46:48.25	.373
49	5 Mar 1987	10:51:05.99	.372	50	5 Mar 1987	01:55:13.23	.368
51	27 Feb 1987	04:50:43.91	.360	52	5 Mar 1987	10:56:58.81	.353
53	5 Mar 1987	11:35:53.70	.349	54	5 Mar 1987	17:47:39.68	.349
55	5 Mar 1987	12:47:11.02	.347	56	5 Mar 1987	10:14:15.43	.344
57	5 Mar 1987	18:20:11.04	.336	58	27 Feb 1987	06:04:06.61	.327
59	27 Feb 1987	08:48:25.59	.326	60	5 Mar 1987	08:00:50.50	.326
61	5 Mar 1987	01:41:38.92	.322	62	5 Mar 1987	11:20:21.94	.320
63	5 Mar 1987	18:09:14.99	.319	64	27 Feb 1987	09:06:44.82	.313
65	5 Mar 1987	13:04:20.92	.309	66	5 Mar 1987	08:35:14.39	.300
67	5 Mar 1987	10:44:41.96	.299	68	27 Feb 1987	06:03:37.18	.298
69	25 Feb 1987	07:28:24.12	.298	70	27 Feb 1987	05:54:02.78	.297
71	5 Mar 1987	07:35:15.26	.297	72	27 Feb 1987	07:37:07.06	.296
73	5 Mar 1987	13:54:47.07	.295	74	5 Mar 1987	13:33:27.22	.294
75	27 Feb 1987	07:40:00.92	.293	76	5 Mar 1987	18:21:41.37	.292
77	5 Mar 1987	13:45:10.63	.290	78	5 Mar 1987	12:59:32.06	.289
79	5 Mar 1987	11:11:25.74	.288	80	5 Mar 1987	01:40:22.78	.284
81	27 Feb 1987	10:02:44.89	.283	82	5 Mar 1987	14:39:05.10	.282
83	5 Mar 1987	08:05:35.40	.281	84	26 Feb 1987	18:36:42.49	.272
85	27 Feb 1987	06:45:39.65	.270	86	5 Mar 1987	00:35:36.68	.269
87	27 Feb 1987	05:48:05.45	.269	88	27 Feb 1987	06:15:25.58	.269
89	5 Mar 1987	17:24:44.65	.268	90	5 Mar 1987	02:10:51.94	.263
91	27 Feb 1987	08:24:53.61	.262	92	5 Mar 1987	10:09:44.69	.259
93	5 Mar 1987	12:34:22.56	.258	94	27 Feb 1987	07:12:54.71	.258
95	27 Feb 1987	07:59:29.92	.256	96	5 Mar 1987	12:26:22.29	.255
97	27 Feb 1987	08:56:28.65	.245	98	5 Mar 1987	13:48:40.89	.244
99	5 Mar 1987	12:38:14.77	.242	100	5 Mar 1987	17:03:28.92	.240
101	26 Feb 1987	18:19:07.23	.240	102	5 Mar 1987	01:15:35.46	.240
103	5 Mar 1987	08:35:14.39	.238	104	27 Feb 1987	10:17:45.62	.233
105	27 Feb 1987	06:40:13.59	.231	106	5 Mar 1987	00:35:36.39	.231
107	27 Feb 1987	10:21:46.37	.228	108	5 Mar 1987	14:25:05.07	.227
109	5 Mar 1987	11:45:19.64	.225	110	27 Feb 1987	08:13:28.43	.221
111	5 Mar 1987	12:08:41.27	.217	112	5 Mar 1987	17:03:31.14	.216
113	5 Mar 1987	07:35:13.40	.215	114	5 Mar 1987	12:20:18.15	.215
115	26 Feb 1987	18:17:13.50	.214	116	5 Mar 1987	12:54:55.06	.210
117	5 Mar 1987	10:38:18.85	.209	118	5 Mar 1987	10:04:41.42	.206
119	5 Mar 1987	07:54:56.75	.205	120	27 Feb 1987	09:14:28.31	.201
121	5 Mar 1987	18:16:06.97	.199	122	27 Feb 1987	08:19:56.05	.198
123	27 Feb 1987	10:05:30.85	.198	124	5 Mar 1987	00:58:56.18	.197
125	5 Mar 1987	02:10:49.70	.197	126	5 Mar 1987	14:26:51.42	.196
127	27 Feb 1987	08:56:39.90	.195	128	26 Feb 1987	18:58:03.59	.194
129	27 Feb 1987	09:10:03.89	.193	130	5 Mar 1987	18:05:28.39	.191

FR 53.5	FR 52.0	FR 60.5	FR 51.0	FR 51.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
131	27 Feb 1987	06:26:32.72	.191	132	27 Feb 1987	09:47:41.86	.188
133	5 Mar 1987	00:58:56.19	.188	134	27 Feb 1987	05:45:21.91	.187
135	27 Feb 1987	08:35:01.33	.184	136	5 Mar 1987	02:41:32.46	.182
137	26 Feb 1987	19:24:42.56	.180	138	27 Feb 1987	08:36:37.45	.180
139	26 Feb 1987	19:46:31.76	.178	140	5 Mar 1987	09:01:00.46	.177
141	5 Mar 1987	02:25:56.98	.171	142	27 Feb 1987	10:00:02.51	.171
143	5 Mar 1987	10:14:14.76	.169	144	27 Feb 1987	06:13:02.61	.158
145	5 Mar 1987	13:29:28.49	.157	146	26 Feb 1987	18:28:25.35	.156
147	26 Feb 1987	18:46:37.59	.150	148	5 Mar 1987	02:43:09.18	.148
149	5 Mar 1987	00:31:00.11	.143	150	5 Mar 1987	00:51:01.19	.143
151	5 Mar 1987	02:34:44.95	.139	152	5 Mar 1987	00:46:33.10	.134
153	5 Mar 1987	07:47:26.85	.132	154	27 Feb 1987	05:27:30.10	.131
155	27 Feb 1987	10:05:30.85	.129	156	5 Mar 1987	02:51:18.81	.127
157	5 Mar 1987	02:51:18.98	.126	158	27 Feb 1987	05:29:05.83	.125
159	26 Feb 1987	19:19:38.86	.123	160	27 Feb 1987	08:05:04.96	.116
161	5 Mar 1987	08:55:05.86	.111	162	5 Mar 1987	08:15:13.01	.110
163	5 Mar 1987	02:34:30.17	.103	164	5 Mar 1987	14:49:14.17	.102
165	26 Feb 1987	19:41:30.86	.100	166	5 Mar 1987	13:54:47.17	.099
167	5 Mar 1987	01:09:13.93	.096	168	5 Mar 1987	02:01:08.37	.096
169	5 Mar 1987	14:14:43.67	.089	170	5 Mar 1987	07:47:32.81	.087
171	27 Feb 1987	08:04:49.06	.083	172	5 Mar 1987	14:49:14.14	.072
173	5 Mar 1987	09:00:57.95	.069	174	5 Mar 1987	08:14:54.71	.065
175	5 Mar 1987	02:26:04.54	.059	176	26 Feb 1987	19:39:26.99	.059
177	5 Mar 1987	14:01:13.31	.055	178	5 Mar 1987	15:05:44.85	.054
179	5 Mar 1987	17:24:44.34	.046	180	5 Mar 1987	01:10:27.36	.044
181	5 Mar 1987	17:34:49.95	.036	182	5 Mar 1987	15:05:47.32	.035
183	5 Mar 1987	14:01:16.44	.035	184	26 Feb 1987	19:47:02.06	.032
185	5 Mar 1987	17:34:44.04	.031	186	5 Mar 1987	08:27:15.35	.028
187	5 Mar 1987	08:20:42.60	.023	188	5 Mar 1987	17:11:38.12	.020
189	5 Mar 1987	17:11:40.69	.017	190	26 Feb 1987	18:28:38.08	.015
191	27 Feb 1987	04:45:09.21	.005	192	26 Feb 1987	18:48:59.28	0.000
193	26 Feb 1987	19:29:38.41	-.028	194	27 Feb 1987	04:55:52.37	-.036
195	26 Feb 1987	19:20:02.68	-.053	196	26 Feb 1987	18:59:26.45	-.083

PRESSURE STATISTICS
ON ALL 'GOOD' PANELS BELOW THE
STRINGER WITH EACH PANEL TAKEN
SEPARATELY (RANKING THE PEAK VALUES
FOR EACH EIGHT MINUTE WINDOW)

All Panels have been taken as an individual event

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.250	490	50.0
2	.250	.500	267	27.2
3	.500	.750	115	11.7
4	.750	1.000	59	6.0
5	1.000	1.250	33	3.4
6	1.250	1.500	11	1.1
7	1.500	1.750	2	.2
Total			977	99.7

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	5 Mar 1987	11:45:19.89	1.533	2	27 Feb 1987	07:02:51.71	1.521
3	5 Mar 1987	13:33:27.35	1.492	4	5 Mar 1987	17:47:40.72	1.458
5	5 Mar 1987	10:27:21.46	1.435	6	5 Mar 1987	11:45:19.62	1.403
7	5 Mar 1987	13:33:27.14	1.350	8	27 Feb 1987	09:39:27.82	1.334
9	5 Mar 1987	11:29:56.19	1.306	10	5 Mar 1987	01:55:13.30	1.293
11	5 Mar 1987	11:10:59.46	1.283	12	27 Feb 1987	08:40:45.68	1.282
13	27 Feb 1987	07:02:51.78	1.254	14	5 Mar 1987	11:45:19.59	1.246
15	5 Mar 1987	10:51:05.99	1.234	16	5 Mar 1987	10:44:41.96	1.222
17	5 Mar 1987	18:18:37.36	1.219	18	27 Feb 1987	05:45:22.27	1.213
19	5 Mar 1987	13:06:23.53	1.200	20	27 Feb 1987	07:58:01.47	1.181
21	5 Mar 1987	13:32:47.34	1.179	22	5 Mar 1987	11:11:25.73	1.177
23	5 Mar 1987	13:30:42.02	1.176	24	27 Feb 1987	09:16:13.86	1.155
25	5 Mar 1987	01:55:12.27	1.147	26	5 Mar 1987	10:51:05.92	1.131
27	5 Mar 1987	11:04:11.67	1.131	28	5 Mar 1987	01:41:38.76	1.128
29	5 Mar 1987	01:55:12.21	1.113	30	27 Feb 1987	05:45:21.91	1.104
31	5 Mar 1987	13:29:28.49	1.087	32	27 Feb 1987	08:48:25.46	1.086
33	5 Mar 1987	10:46:35.94	1.085	34	27 Feb 1987	09:39:27.78	1.085
35	5 Mar 1987	12:26:22.48	1.077	36	27 Feb 1987	07:59:32.75	1.064
37	5 Mar 1987	11:35:54.23	1.054	38	27 Feb 1987	07:50:52.94	1.032
39	5 Mar 1987	12:17:43.00	1.032	40	5 Mar 1987	12:47:11.68	1.031
41	5 Mar 1987	07:54:56.84	1.026	42	5 Mar 1987	10:45:29.20	1.020
43	27 Feb 1987	07:35:28.73	1.012	44	5 Mar 1987	13:29:28.43	1.011
45	5 Mar 1987	12:20:18.15	1.005	46	27 Feb 1987	09:13:21.21	1.002
47	27 Feb 1987	08:38:17.65	.999	48	5 Mar 1987	08:06:03.94	.997
49	5 Mar 1987	12:30:18.88	.996	50	27 Feb 1987	07:38:31.23	.993
51	25 Feb 1987	07:29:41.06	.993	52	26 Feb 1987	18:36:42.93	.991
53	5 Mar 1987	11:19:52.30	.989	54	5 Mar 1987	10:37:34.84	.986
55	27 Feb 1987	09:39:27.85	.978	56	27 Feb 1987	07:45:10.58	.972
57	5 Mar 1987	01:55:12.14	.970	58	5 Mar 1987	10:41:06.28	.962
59	5 Mar 1987	01:41:39.25	.956	60	5 Mar 1987	01:41:38.97	.940
61	5 Mar 1987	10:45:29.08	.937	62	5 Mar 1987	08:52:27.74	.936
63	5 Mar 1987	11:04:11.38	.935	64	27 Feb 1987	05:45:21.72	.935
65	27 Feb 1987	07:03:38.04	.931	66	5 Mar 1987	13:54:47.34	.930
67	27 Feb 1987	07:37:07.12	.924	68	5 Mar 1987	10:44:05.01	.916
69	27 Feb 1987	05:43:53.20	.911	70	5 Mar 1987	14:39:41.97	.910
71	5 Mar 1987	12:38:14.91	.906	72	5 Mar 1987	12:20:18.06	.900
73	26 Feb 1987	18:36:42.73	.898	74	5 Mar 1987	11:10:42.11	.887
75	5 Mar 1987	13:30:41.62	.886	76	26 Feb 1987	18:36:43.02	.874
77	27 Feb 1987	04:50:43.86	.867	78	27 Feb 1987	08:53:59.01	.858
79	5 Mar 1987	13:54:55.42	.855	80	27 Feb 1987	09:12:45.32	.854
81	5 Mar 1987	13:33:26.92	.845	82	5 Mar 1987	12:20:18.26	.842
83	27 Feb 1987	04:50:43.94	.830	84	27 Feb 1987	05:54:02.91	.809
85	27 Feb 1987	06:04:06.87	.807	86	5 Mar 1987	11:34:15.19	.807
87	27 Feb 1987	05:54:02.25	.798	88	27 Feb 1987	06:07:23.71	.797
89	27 Feb 1987	05:54:02.43	.796	90	27 Feb 1987	09:00:20.54	.793
91	5 Mar 1987	13:33:27.01	.791	92	5 Mar 1987	12:54:50.82	.787
93	5 Mar 1987	13:46:03.80	.786	94	27 Feb 1987	07:56:34.63	.782
95	27 Feb 1987	07:38:31.02	.781	96	5 Mar 1987	01:55:12.41	.778
97	5 Mar 1987	14:50:38.28	.776	98	5 Mar 1987	07:56:20.68	.770
99	5 Mar 1987	10:44:42.11	.767	100	27 Feb 1987	07:45:10.30	.766
101	27 Feb 1987	05:51:32.86	.763	102	27 Feb 1987	09:39:27.77	.763
103	27 Feb 1987	06:03:37.20	.760	104	5 Mar 1987	17:56:33.94	.753
105	5 Mar 1987	12:21:48.52	.751	106	27 Feb 1987	08:36:37.44	.749
107	27 Feb 1987	06:23:26.39	.749	108	26 Feb 1987	18:46:03.13	.743
109	5 Mar 1987	07:56:20.36	.742	110	5 Mar 1987	07:56:20.25	.739
111	27 Feb 1987	07:45:10.17	.733	112	27 Feb 1987	05:58:28.14	.731
113	5 Mar 1987	10:44:41.85	.730	114	5 Mar 1987	10:09:44.56	.723
115	5 Mar 1987	10:03:11.08	.720	116	5 Mar 1987	12:49:21.80	.714
117	5 Mar 1987	10:27:42.42	.713	118	5 Mar 1987	01:55:13.09	.713
119	27 Feb 1987	05:01:25.95	.712	120	5 Mar 1987	11:35:53.68	.707
121	5 Mar 1987	11:06:34.17	.706	122	5 Mar 1987	13:30:41.72	.705
123	27 Feb 1987	08:50:29.42	.704	124	5 Mar 1987	10:51:06.07	.702
125	5 Mar 1987	10:41:06.35	.701	126	26 Feb 1987	18:36:43.18	.696
127	5 Mar 1987	13:30:01.36	.694	128	5 Mar 1987	14:11:42.91	.693
129	27 Feb 1987	07:46:03.54	.692	130	5 Mar 1987	14:37:01.47	.683

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
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Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
131	5 Mar 1987	12:17:42.95	.681	132	27 Feb 1987	09:06:44.85	.676
133	27 Feb 1987	07:50:52.69	.672	134	5 Mar 1987	12:21:24.72	.672
135	27 Feb 1987	05:58:28.26	.670	136	5 Mar 1987	12:30:19.05	.669
137	27 Feb 1987	06:03:37.17	.668	138	26 Feb 1987	19:46:24.19	.667
139	27 Feb 1987	07:45:10.09	.666	140	5 Mar 1987	12:49:21.58	.661
141	5 Mar 1987	10:37:47.30	.658	142	5 Mar 1987	11:17:17.74	.658
143	5 Mar 1987	10:02:59.21	.653	144	27 Feb 1987	05:00:09.85	.652
145	5 Mar 1987	13:48:41.22	.651	146	5 Mar 1987	12:27:03.18	.650
147	27 Feb 1987	08:42:12.89	.644	148	5 Mar 1987	11:07:33.21	.642
149	27 Feb 1987	07:44:16.32	.632	150	5 Mar 1987	14:37:01.44	.627
151	27 Feb 1987	06:24:10.11	.621	152	27 Feb 1987	06:58:06.73	.619
153	5 Mar 1987	00:35:36.72	.619	154	5 Mar 1987	08:03:42.82	.614
155	5 Mar 1987	13:54:55.23	.614	156	27 Feb 1987	06:24:09.84	.613
157	26 Feb 1987	19:24:42.89	.612	158	5 Mar 1987	10:09:44.63	.608
159	27 Feb 1987	10:05:30.85	.607	160	27 Feb 1987	10:17:45.59	.602
161	5 Mar 1987	01:41:38.91	.601	162	5 Mar 1987	01:55:12.13	.598
163	5 Mar 1987	10:18:18.91	.594	164	5 Mar 1987	10:27:21.53	.590
165	26 Feb 1987	19:46:23.87	.588	166	5 Mar 1987	11:15:23.38	.588
167	5 Mar 1987	13:46:03.48	.585	168	26 Feb 1987	18:36:42.70	.584
169	5 Mar 1987	18:09:22.61	.582	170	27 Feb 1987	08:46:48.25	.581
171	5 Mar 1987	00:32:36.93	.574	172	5 Mar 1987	08:03:42.79	.570
173	5 Mar 1987	10:32:38.79	.570	174	5 Mar 1987	11:34:34.00	.569
175	27 Feb 1987	09:14:28.38	.566	176	27 Feb 1987	07:37:07.06	.566
177	25 Feb 1987	07:29:08.27	.565	178	26 Feb 1987	18:50:38.06	.563
179	5 Mar 1987	11:15:23.22	.561	180	5 Mar 1987	10:51:33.76	.557
181	5 Mar 1987	00:37:48.73	.554	182	27 Feb 1987	04:44:38.66	.552
183	26 Feb 1987	18:57:45.60	.552	184	5 Mar 1987	08:33:51.12	.552
185	26 Feb 1987	18:48:58.55	.552	186	5 Mar 1987	12:25:25.86	.551
187	5 Mar 1987	11:20:29.46	.550	188	5 Mar 1987	10:13:47.90	.549
189	26 Feb 1987	18:16:27.66	.547	190	5 Mar 1987	18:09:14.00	.544
191	5 Mar 1987	10:37:47.45	.540	192	27 Feb 1987	08:57:53.81	.539
193	27 Feb 1987	10:02:44.89	.539	194	27 Feb 1987	09:06:45.03	.539
195	5 Mar 1987	10:57:08.34	.537	196	5 Mar 1987	10:52:00.72	.537
197	5 Mar 1987	10:02:59.07	.534	198	26 Feb 1987	19:24:42.56	.531
199	5 Mar 1987	14:33:44.83	.529	200	5 Mar 1987	13:36:58.04	.529
201	5 Mar 1987	10:22:24.92	.528	202	5 Mar 1987	11:04:11.33	.527
203	5 Mar 1987	08:52:27.74	.525	204	5 Mar 1987	12:49:21.44	.524
205	5 Mar 1987	12:30:19.13	.519	206	27 Feb 1987	05:01:26.06	.517
207	5 Mar 1987	10:27:22.29	.516	208	27 Feb 1987	07:54:23.84	.515
209	5 Mar 1987	17:47:40.41	.515	210	27 Feb 1987	07:13:54.76	.513
211	5 Mar 1987	10:03:11.19	.512	212	5 Mar 1987	18:09:14.99	.510
213	5 Mar 1987	10:27:42.14	.509	214	27 Feb 1987	06:40:17.64	.508
215	26 Feb 1987	18:50:37.85	.507	216	5 Mar 1987	13:32:47.14	.505
217	27 Feb 1987	09:48:05.45	.504	218	27 Feb 1987	09:39:27.79	.503
219	27 Feb 1987	07:12:55.04	.502	220	26 Feb 1987	18:28:25.75	.501
221	27 Feb 1987	06:22:55.85	.495	222	27 Feb 1987	09:06:44.82	.491
223	27 Feb 1987	07:06:59.87	.490	224	27 Feb 1987	08:41:02.03	.490
225	27 Feb 1987	09:46:13.94	.488	226	5 Mar 1987	14:35:49.59	.487
227	5 Mar 1987	10:32:46.11	.486	228	27 Feb 1987	06:40:13.66	.486
229	5 Mar 1987	11:20:21.94	.482	230	5 Mar 1987	14:45:18.36	.481
231	25 Feb 1987	07:28:24.26	.478	232	5 Mar 1987	12:49:21.37	.477
233	27 Feb 1987	07:36:06.09	.476	234	5 Mar 1987	08:05:35.40	.475
235	27 Feb 1987	09:53:33.90	.474	236	27 Feb 1987	07:54:57.27	.473
237	26 Feb 1987	19:17:37.13	.472	238	26 Feb 1987	18:36:42.37	.472
239	5 Mar 1987	18:01:13.27	.471	240	5 Mar 1987	12:56:10.33	.471
241	27 Feb 1987	04:44:59.22	.471	242	27 Feb 1987	06:40:13.59	.468
243	27 Feb 1987	09:38:34.62	.468	244	5 Mar 1987	02:25:33.88	.467
245	27 Feb 1987	09:04:20.30	.467	246	27 Feb 1987	08:22:08.87	.465
247	27 Feb 1987	08:57:54.17	.464	248	5 Mar 1987	14:30:55.62	.464
249	5 Mar 1987	07:33:05.51	.464	250	5 Mar 1987	08:54:50.67	.460
251	5 Mar 1987	11:34:34.09	.460	252	26 Feb 1987	18:46:50.47	.459
253	5 Mar 1987	11:20:22.04	.459	254	5 Mar 1987	12:40:14.79	.454
255	25 Feb 1987	07:28:24.22	.451	256	27 Feb 1987	06:23:26.41	.448
257	27 Feb 1987	07:48:09.66	.446	258	5 Mar 1987	10:08:15.19	.445
259	27 Feb 1987	04:57:52.23	.445	260	5 Mar 1987	11:17:09.43	.443

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
261	26 Feb	1987 18:20:27.61	.441	262	5 Mar	1987 18:05:28.67	.440
263	5 Mar	1987 14:37:01.47	.439	264	5 Mar	1987 07:54:56.65	.439
265	27 Feb	1987 09:14:28.31	.439	266	5 Mar	1987 12:08:41.50	.438
267	5 Mar	1987 18:05:28.39	.437	268	5 Mar	1987 01:19:50.58	.434
269	27 Feb	1987 06:13:08.35	.434	270	27 Feb	1987 06:26:33.37	.432
271	27 Feb	1987 05:01:25.99	.431	272	5 Mar	1987 11:17:09.54	.428
273	5 Mar	1987 12:25:26.22	.426	274	25 Feb	1987 07:28:24.03	.424
275	5 Mar	1987 02:06:19.23	.423	276	27 Feb	1987 06:42:20.71	.423
277	27 Feb	1987 07:56:58.66	.423	278	5 Mar	1987 11:42:41.37	.422
279	5 Mar	1987 13:04:25.36	.422	280	27 Feb	1987 09:59:07.10	.420
281	5 Mar	1987 11:04:24.76	.420	282	5 Mar	1987 13:39:21.25	.420
283	5 Mar	1987 02:44:25.86	.419	284	5 Mar	1987 08:35:14.39	.417
285	27 Feb	1987 07:39:27.01	.417	286	26 Feb	1987 18:21:01.16	.417
287	27 Feb	1987 09:53:08.85	.416	288	27 Feb	1987 08:38:54.24	.416
289	5 Mar	1987 18:20:11.04	.416	290	5 Mar	1987 12:17:43.11	.414
291	27 Feb	1987 07:37:07.06	.414	292	27 Feb	1987 08:04:18.01	.412
293	26 Feb	1987 18:59:26.45	.412	294	27 Feb	1987 10:21:46.37	.411
295	27 Feb	1987 10:01:09.04	.410	296	25 Feb	1987 07:28:24.13	.410
297	27 Feb	1987 08:24:04.32	.407	298	5 Mar	1987 12:49:21.51	.406
299	5 Mar	1987 15:05:45.00	.406	300	5 Mar	1987 18:05:28.49	.404
301	5 Mar	1987 17:47:40.62	.403	302	27 Feb	1987 09:47:34.79	.401
303	27 Feb	1987 06:42:16.48	.400	304	5 Mar	1987 12:34:25.23	.398
305	5 Mar	1987 18:09:13.85	.395	306	26 Feb	1987 19:23:13.24	.395
307	27 Feb	1987 08:53:50.76	.395	308	5 Mar	1987 11:29:33.73	.394
309	26 Feb	1987 18:16:27.75	.394	310	26 Feb	1987 19:46:31.76	.391
311	5 Mar	1987 10:38:05.53	.390	312	27 Feb	1987 08:42:12.76	.390
313	26 Feb	1987 18:28:25.35	.389	314	27 Feb	1987 08:21:49.35	.388
315	5 Mar	1987 18:23:59.65	.388	316	27 Feb	1987 09:41:54.78	.387
317	5 Mar	1987 11:20:29.33	.386	318	5 Mar	1987 10:27:42.06	.386
319	26 Feb	1987 19:46:42.79	.385	320	26 Feb	1987 18:57:21.30	.384
321	27 Feb	1987 09:59:06.43	.384	322	26 Feb	1987 18:19:07.29	.383
323	5 Mar	1987 11:22:14.87	.382	324	5 Mar	1987 12:30:19.05	.381
325	27 Feb	1987 08:38:53.21	.381	326	27 Feb	1987 10:21:46.37	.380
327	27 Feb	1987 08:38:17.57	.380	328	5 Mar	1987 13:08:32.42	.378
329	5 Mar	1987 02:26:04.54	.376	330	5 Mar	1987 08:32:18.33	.374
331	5 Mar	1987 13:38:50.41	.368	332	26 Feb	1987 19:24:21.70	.367
333	5 Mar	1987 11:17:17.84	.367	334	27 Feb	1987 06:04:06.61	.365
335	5 Mar	1987 18:12:36.81	.364	336	27 Feb	1987 04:50:43.79	.364
337	5 Mar	1987 14:39:42.20	.364	338	5 Mar	1987 10:52:00.86	.363
339	27 Feb	1987 06:13:02.39	.362	340	27 Feb	1987 07:54:08.69	.362
341	26 Feb	1987 19:19:20.30	.362	342	26 Feb	1987 18:28:25.40	.362
343	5 Mar	1987 12:55:44.49	.361	344	5 Mar	1987 14:14:11.18	.359
345	26 Feb	1987 18:16:27.59	.359	346	5 Mar	1987 12:33:47.98	.358
347	27 Feb	1987 08:13:28.62	.356	348	5 Mar	1987 13:29:28.43	.356
349	5 Mar	1987 13:04:21.80	.355	350	27 Feb	1987 06:13:02.09	.355
351	5 Mar	1987 09:01:33.20	.355	352	26 Feb	1987 18:17:55.78	.354
353	5 Mar	1987 10:38:05.70	.350	354	27 Feb	1987 06:03:37.17	.350
355	5 Mar	1987 12:58:22.42	.349	356	5 Mar	1987 02:05:53.97	.349
357	5 Mar	1987 14:26:10.88	.349	358	5 Mar	1987 12:06:02.33	.348
359	27 Feb	1987 05:45:00.72	.347	360	5 Mar	1987 01:40:23.01	.346
361	5 Mar	1987 18:06:48.56	.346	362	5 Mar	1987 12:27:30.74	.346
363	26 Feb	1987 18:58:56.23	.345	364	26 Feb	1987 18:48:22.58	.345
365	26 Feb	1987 18:53:57.68	.345	366	27 Feb	1987 06:11:23.67	.344
367	27 Feb	1987 07:09:30.13	.343	368	27 Feb	1987 09:48:22.87	.343
369	27 Feb	1987 08:56:39.90	.342	370	25 Feb	1987 07:27:48.94	.342
371	27 Feb	1987 06:06:46.55	.342	372	27 Feb	1987 05:55:38.05	.341
373	27 Feb	1987 06:40:04.41	.341	374	5 Mar	1987 12:06:02.46	.340
375	27 Feb	1987 04:54:12.17	.339	376	27 Feb	1987 08:35:01.34	.338
377	5 Mar	1987 02:01:54.16	.338	378	27 Feb	1987 09:04:19.85	.337
379	27 Feb	1987 07:13:54.62	.337	380	5 Mar	1987 13:04:22.08	.333
381	27 Feb	1987 08:40:48.78	.333	382	5 Mar	1987 12:08:40.74	.331
383	27 Feb	1987 06:22:55.50	.330	384	27 Feb	1987 05:25:13.75	.329
385	5 Mar	1987 18:09:12.86	.328	386	27 Feb	1987 09:42:30.76	.327
387	5 Mar	1987 07:32:20.06	.327	388	5 Mar	1987 02:44:25.65	.327
389	27 Feb	1987 05:55:38.05	.326	390	26 Feb	1987 19:23:43.14	.326

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
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Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
391	27 Feb 1987	07:04:16.20	.325	392	26 Feb 1987	19:46:31.67	.325
393	5 Mar 1987	17:03:28.99	.324	394	26 Feb 1987	19:12:45.00	.324
395	26 Feb 1987	18:36:42.49	.324	396	5 Mar 1987	14:14:11.46	.322
397	26 Feb 1987	19:46:23.57	.322	398	5 Mar 1987	11:34:15.53	.322
399	5 Mar 1987	14:42:07.84	.321	400	27 Feb 1987	07:04:16.43	.321
401	26 Feb 1987	18:54:21.94	.320	402	25 Feb 1987	07:29:08.17	.320
403	5 Mar 1987	10:34:05.92	.320	404	5 Mar 1987	11:39:48.47	.320
405	26 Feb 1987	19:41:47.78	.316	406	5 Mar 1987	13:43:22.55	.316
407	5 Mar 1987	08:52:50.96	.316	408	25 Feb 1987	07:29:26.01	.315
409	27 Feb 1987	05:41:47.93	.315	410	27 Feb 1987	06:42:16.26	.314
411	25 Feb 1987	07:27:50.45	.314	412	26 Feb 1987	18:59:26.33	.313
413	27 Feb 1987	09:59:06.79	.313	414	5 Mar 1987	11:30:27.61	.313
415	27 Feb 1987	04:55:52.59	.313	416	5 Mar 1987	08:05:35.49	.313
417	26 Feb 1987	19:14:46.02	.311	418	27 Feb 1987	08:24:04.19	.311
419	5 Mar 1987	07:32:19.93	.309	420	5 Mar 1987	12:48:45.80	.309
421	5 Mar 1987	12:08:40.38	.307	422	5 Mar 1987	14:11:27.23	.306
423	27 Feb 1987	05:29:20.36	.306	424	26 Feb 1987	18:19:07.23	.305
425	5 Mar 1987	02:09:16.74	.305	426	5 Mar 1987	01:15:35.56	.304
427	5 Mar 1987	14:14:11.34	.304	428	5 Mar 1987	01:10:27.36	.303
429	5 Mar 1987	17:24:45.44	.302	430	5 Mar 1987	08:15:45.02	.302
431	27 Feb 1987	08:13:28.49	.302	432	26 Feb 1987	18:46:50.54	.301
433	5 Mar 1987	14:36:05.83	.300	434	27 Feb 1987	07:02:51.71	.299
435	5 Mar 1987	02:02:09.21	.296	436	5 Mar 1987	07:56:20.32	.295
437	26 Feb 1987	18:30:42.50	.295	438	27 Feb 1987	06:13:08.43	.295
439	27 Feb 1987	05:27:45.94	.293	440	26 Feb 1987	18:46:50.66	.293
441	26 Feb 1987	19:41:30.79	.293	442	5 Mar 1987	12:36:49.21	.292
443	5 Mar 1987	18:20:11.15	.292	444	5 Mar 1987	10:51:06.07	.292
445	26 Feb 1987	18:46:37.59	.292	446	5 Mar 1987	18:24:00.20	.290
447	26 Feb 1987	19:26:52.64	.290	448	27 Feb 1987	09:40:51.29	.289
449	5 Mar 1987	13:53:32.67	.289	450	5 Mar 1987	12:55:44.52	.288
451	5 Mar 1987	13:43:22.49	.288	452	5 Mar 1987	14:33:44.79	.287
453	27 Feb 1987	07:45:03.72	.285	454	27 Feb 1987	08:24:07.53	.285
455	27 Feb 1987	08:13:28.43	.284	456	5 Mar 1987	13:04:21.59	.284
457	5 Mar 1987	11:20:29.33	.283	458	5 Mar 1987	13:33:27.09	.283
459	5 Mar 1987	14:02:54.26	.281	460	26 Feb 1987	18:19:07.15	.280
461	5 Mar 1987	14:26:10.32	.277	462	27 Feb 1987	08:38:47.37	.277
463	27 Feb 1987	08:13:28.43	.277	464	5 Mar 1987	12:38:14.54	.276
465	27 Feb 1987	08:45:59.15	.272	466	5 Mar 1987	02:01:54.39	.272
467	5 Mar 1987	18:09:13.98	.272	468	5 Mar 1987	00:58:56.16	.270
469	27 Feb 1987	05:55:38.03	.270	470	26 Feb 1987	18:25:23.77	.268
471	26 Feb 1987	19:4[illegible]:31.13	.265	472	27 Feb 1987	08:56:30.40	.265
473	26 Feb 1987	19:13:19.01	.261	474	26 Feb 1987	19:26:05.28	.261
475	5 Mar 1987	17:51:17.12	.261	476	27 Feb 1987	06:11:23.69	.260
477	5 Mar 1987	10:25:44.39	.259	478	5 Mar 1987	13:44:46.18	.257
479	5 Mar 1987	02:43:05.48	.255	480	5 Mar 1987	02:53:44.34	.254
481	27 Feb 1987	04:49:01.29	.254	482	5 Mar 1987	00:58:56.23	.252
483	5 Mar 1987	17:53:12.93	.252	484	27 Feb 1987	06:42:21.97	.251
485	27 Feb 1987	07:14:07.18	.251	486	5 Mar 1987	14:41:24.99	.251
487	27 Feb 1987	07:02:51.79	.251	488	5 Mar 1987	14:13:50.92	.250
489	5 Mar 1987	02:10:06.66	.248	490	5 Mar 1987	11:42:41.97	.247
491	5 Mar 1987	14:22:26.59	.246	492	27 Feb 1987	07:35:05.73	.246
493	5 Mar 1987	18:20:11.04	.246	494	27 Feb 1987	06:13:02.09	.245
495	5 Mar 1987	08:30:56.21	.245	496	5 Mar 1987	12:48:39.92	.244
497	26 Feb 1987	19:23:42.96	.243	498	26 Feb 1987	19:41:30.86	.242
499	26 Feb 1987	18:28:25.28	.241	500	5 Mar 1987	10:44:41.85	.240
501	5 Mar 1987	13:53:32.62	.238	502	27 Feb 1987	10:20:08.27	.236
503	5 Mar 1987	00:46:12.51	.235	504	5 Mar 1987	13:26:34.66	.234
505	5 Mar 1987	18:19:54.82	.234	506	27 Feb 1987	05:45:21.98	.233
507	27 Feb 1987	08:23:11.56	.231	508	5 Mar 1987	12:11:57.94	.231
509	5 Mar 1987	10:18:45.39	.231	510	27 Feb 1987	08:05:05.03	.230
511	5 Mar 1987	02:44:25.88	.226	512	5 Mar 1987	14:39:10.21	.225
513	5 Mar 1987	08:36:47.52	.225	514	5 Mar 1987	14:37:01.44	.223
515	5 Mar 1987	14:22:26.59	.222	516	27 Feb 1987	08:57:53.81	.222
517	5 Mar 1987	13:08:32.41	.220	518	27 Feb 1987	05:25:37.00	.219
519	27 Feb 1987	10:20:37.47	.218	520	27 Feb 1987	09:04:19.85	.218

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
521	26 Feb 1987	18:44:42.25	.217	522	5 Mar 1987	14:26:10.39	.215
523	26 Feb 1987	19:41:22.21	.215	524	5 Mar 1987	18:14:27.33	.211
525	27 Feb 1987	05:54:02.57	.208	526	5 Mar 1987	13:04:25.36	.206
527	27 Feb 1987	10:01:08.68	.206	528	27 Feb 1987	08:34:38.90	.205
529	5 Mar 1987	15:05:45.63	.205	530	27 Feb 1987	08:56:30.40	.205
531	27 Feb 1987	08:13:28.62	.204	532	27 Feb 1987	05:25:37.88	.204
533	27 Feb 1987	04:47:20.24	.204	534	5 Mar 1987	02:01:53.86	.204
535	5 Mar 1987	12:40:29.10	.204	536	27 Feb 1987	05:41:21.49	.203
537	27 Feb 1987	08:34:44.76	.203	538	5 Mar 1987	14:13:50.98	.202
539	27 Feb 1987	10:05:30.81	.202	540	27 Feb 1987	08:22:19.14	.200
541	5 Mar 1987	15:05:45.41	.200	542	5 Mar 1987	12:40:29.20	.198
543	26 Feb 1987	19:41:22.28	.198	544	27 Feb 1987	10:05:30.81	.197
545	26 Feb 1987	19:41:22.14	.197	546	27 Feb 1987	10:03:20.29	.197
547	26 Feb 1987	18:53:58.00	.197	548	27 Feb 1987	08:23:17.12	.195
549	26 Feb 1987	19:46:42.79	.195	550	5 Mar 1987	00:58:56.22	.194
551	5 Mar 1987	11:04:24.76	.193	552	27 Feb 1987	05:42:07.67	.192
553	5 Mar 1987	14:22:26.75	.192	554	5 Mar 1987	08:35:14.53	.190
555	5 Mar 1987	13:54:47.00	.189	556	5 Mar 1987	02:26:04.47	.189
557	26 Feb 1987	18:38:06.19	.187	558	5 Mar 1987	02:44:25.52	.187
559	5 Mar 1987	14:45:18.53	.186	560	5 Mar 1987	10:03:11.19	.186
561	5 Mar 1987	12:48:40.06	.185	562	27 Feb 1987	09:02:47.07	.185
563	5 Mar 1987	01:05:39.63	.185	564	5 Mar 1987	00:46:12.30	.185
565	5 Mar 1987	08:14:54.71	.184	566	26 Feb 1987	18:25:52.76	.184
567	26 Feb 1987	19:18:43.94	.184	568	27 Feb 1987	05:01:26.12	.184
569	27 Feb 1987	10:06:34.69	.184	570	5 Mar 1987	10:13:47.47	.182
571	5 Mar 1987	07:55:04.32	.182	572	26 Feb 1987	19:24:42.56	.180
573	27 Feb 1987	07:37:23.97	.178	574	27 Feb 1987	05:25:13.67	.177
575	5 Mar 1987	12:53:26.63	.176	576	27 Feb 1987	08:04:35.97	.176
577	5 Mar 1987	10:24:32.78	.175	578	27 Feb 1987	05:01:25.99	.175
579	27 Feb 1987	04:47:44.56	.175	580	27 Feb 1987	09:10:03.89	.173
581	26 Feb 1987	19:23:33.55	.173	582	5 Mar 1987	08:14:54.68	.173
583	5 Mar 1987	02:10:06.01	.173	584	5 Mar 1987	13:04:06.32	.171
585	27 Feb 1987	07:13:23.33	.171	586	5 Mar 1987	14:49:14.14	.170
587	5 Mar 1987	10:18:45.58	.170	588	5 Mar 1987	07:47:33.02	.170
589	5 Mar 1987	07:56:20.35	.169	590	5 Mar 1987	18:03:51.72	.168
591	5 Mar 1987	14:42:07.93	.168	592	5 Mar 1987	07:56:22.86	.168
593	26 Feb 1987	19:46:23.64	.167	594	26 Feb 1987	19:18:37.01	.166
595	5 Mar 1987	14:25:33.50	.166	596	27 Feb 1987	08:22:56.58	.165
597	5 Mar 1987	10:13:47.47	.164	598	27 Feb 1987	10:02:44.54	.164
599	5 Mar 1987	08:14:54.75	.164	600	5 Mar 1987	07:36:40.97	.161
601	5 Mar 1987	11:43:03.77	.161	602	5 Mar 1987	14:54:08.69	.160
603	5 Mar 1987	12:53:26.48	.160	604	5 Mar 1987	11:04:13.97	.159
605	5 Mar 1987	02:10:05.90	.158	606	27 Feb 1987	10:16:55.12	.157
607	5 Mar 1987	14:49:14.16	.157	608	27 Feb 1987	08:05:04.96	.157
609	5 Mar 1987	11:04:14.01	.156	610	5 Mar 1987	14:45:18.40	.156
611	5 Mar 1987	02:09:16.71	.155	612	27 Feb 1987	07:03:38.04	.155
613	26 Feb 1987	18:19:07.23	.155	614	5 Mar 1987	12:30:18.88	.154
615	5 Mar 1987	17:03:11.92	.153	616	27 Feb 1987	08:13:28.42	.153
617	5 Mar 1987	11:42:41.97	.153	618	5 Mar 1987	11:04:11.67	.153
619	5 Mar 1987	17:51:17.29	.152	620	27 Feb 1987	08:00:37.90	.150
621	5 Mar 1987	08:30:56.21	.150	622	5 Mar 1987	12:53:26.10	.149
623	5 Mar 1987	08:31:12.42	.145	624	26 Feb 1987	18:57:45.57	.143
625	5 Mar 1987	02:01:54.16	.143	626	5 Mar 1987	13:46:34.21	.142
627	5 Mar 1987	01:41:59.22	.142	628	26 Feb 1987	19:19:38.76	.140
629	5 Mar 1987	14:03:13.17	.140	630	5 Mar 1987	02:53:36.50	.140
631	5 Mar 1987	18:09:13.85	.139	632	5 Mar 1987	07:32:20.18	.139
633	5 Mar 1987	13:30:41.80	.138	634	5 Mar 1987	09:00:57.95	.138
635	5 Mar 1987	14:25:33.63	.138	636	5 Mar 1987	01:05:39.60	.137
637	5 Mar 1987	08:16:09.64	.137	638	27 Feb 1987	10:05:31.06	.137
639	5 Mar 1987	18:06:48.53	.137	640	5 Mar 1987	18:21:14.01	.136
641	5 Mar 1987	02:01:53.86	.136	642	27 Feb 1987	08:05:04.83	.135
643	5 Mar 1987	08:36:40.11	.135	644	5 Mar 1987	11:19:51.84	.134
645	5 Mar 1987	12:12:41.27	.133	646	27 Feb 1987	06:13:02.39	.133
647	27 Feb 1987	08:05:04.96	.133	648	5 Mar 1987	10:53:22.27	.132
649	5 Mar 1987	12:57:10.41	.131	650	5 Mar 1987	18:09:14.03	.130

FR 53.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
651	26 Feb 1987	18:38:06.08	.128	652	5 Mar 1987	09:01:25.09	.127
653	5 Mar 1987	02:10:54.95	.125	654	5 Mar 1987	02:44:25.32	.123
655	27 Feb 1987	10:02:37.03	.121	656	5 Mar 1987	12:53:26.10	.120
657	5 Mar 1987	02:10:44.06	.120	658	5 Mar 1987	13:53:32.62	.119
659	5 Mar 1987	14:25:53.23	.119	660	5 Mar 1987	17:44:47.63	.118
661	5 Mar 1987	00:47:29.47	.117	662	27 Feb 1987	08:04:59.10	.116
663	5 Mar 1987	01:41:38.92	.116	664	27 Feb 1987	08:00:37.90	.115
665	27 Feb 1987	04:50:32.95	.114	666	5 Mar 1987	02:34:15.72	.114
667	27 Feb 1987	08:05:04.83	.113	668	27 Feb 1987	10:06:33.12	.112
669	27 Feb 1987	08:19:51.65	.112	670	27 Feb 1987	09:06:45.39	.110
671	26 Feb 1987	19:40:02.14	.110	672	27 Feb 1987	06:42:20.35	.110
673	5 Mar 1987	13:53:32.69	.110	674	27 Feb 1987	05:45:21.91	.109
675	5 Mar 1987	13:43:16.12	.108	676	5 Mar 1987	11:45:19.88	.107
677	5 Mar 1987	02:24:33.97	.107	678	5 Mar 1987	01:17:28.35	.107
679	27 Feb 1987	10:10:10.38	.106	680	27 Feb 1987	08:34:44.76	.106
681	5 Mar 1987	07:47:36.49	.106	682	5 Mar 1987	14:36:05.83	.105
683	27 Feb 1987	08:19:51.58	.105	684	5 Mar 1987	17:03:31.04	.105
685	5 Mar 1987	12:08:42.46	.104	686	5 Mar 1987	14:17:24.53	.104
687	27 Feb 1987	08:22:19.14	.103	688	5 Mar 1987	08:16:09.82	.102
689	26 Feb 1987	19:41:22.28	.102	690	27 Feb 1987	09:12:45.17	.101
691	27 Feb 1987	08:42:12.89	.101	692	5 Mar 1987	14:03:13.34	.100
693	5 Mar 1987	13:53:32.69	.099	694	5 Mar 1987	00:46:33.11	.099
695	5 Mar 1987	17:56:33.66	.099	696	5 Mar 1987	08:53:11.57	.098
697	27 Feb 1987	09:05:34.37	.098	698	5 Mar 1987	14:11:09.21	.098
699	27 Feb 1987	05:29:33.24	.097	700	5 Mar 1987	14:01:02.18	.097
701	5 Mar 1987	14:50:38.38	.096	702	5 Mar 1987	17:53:12.93	.092
703	5 Mar 1987	10:06:52.84	.092	704	5 Mar 1987	10:53:22.24	.091
705	5 Mar 1987	18:03:51.80	.090	706	5 Mar 1987	00:47:29.84	.088
707	5 Mar 1987	07:47:36.59	.087	708	5 Mar 1987	11:20:21.94	.086
709	27 Feb 1987	10:20:37.41	.086	710	5 Mar 1987	09:01:00.34	.085
711	5 Mar 1987	18:19:54.82	.085	712	27 Feb 1987	07:59:32.69	.084
713	5 Mar 1987	12:17:43.00	.084	714	5 Mar 1987	01:09:13.98	.083
715	26 Feb 1987	19:19:38.86	.082	716	27 Feb 1987	10:05:30.85	.081
717	26 Feb 1987	18:53:58.00	.081	718	5 Mar 1987	02:34:16.83	.080
719	5 Mar 1987	14:14:40.96	.080	720	5 Mar 1987	15:05:45.35	.079
721	5 Mar 1987	13:44:46.18	.078	722	5 Mar 1987	10:38:05.53	.076
723	26 Feb 1987	18:26:51.99	.076	724	5 Mar 1987	11:40:48.52	.075
725	5 Mar 1987	14:54:08.79	.075	726	5 Mar 1987	12:20:18.06	.072
727	5 Mar 1987	08:14:54.66	.072	728	27 Feb 1987	06:40:13.59	.071
729	5 Mar 1987	15:05:31.54	.071	730	5 Mar 1987	14:02:52.92	.071
731	5 Mar 1987	09:00:58.13	.069	732	5 Mar 1987	14:02:53.10	.069
733	5 Mar 1987	01:41:59.22	.068	734	5 Mar 1987	17:56:33.55	.067
735	5 Mar 1987	01:41:38.78	.067	736	5 Mar 1987	12:11:50.43	.066
737	27 Feb 1987	06:00:41.33	.065	738	26 Feb 1987	19:38:26.44	.065
739	5 Mar 1987	10:38:05.70	.064	740	27 Feb 1987	05:25:37.30	.063
741	27 Feb 1987	09:48:22.87	.062	742	5 Mar 1987	17:56:33.68	.062
743	5 Mar 1987	15:05:45.23	.061	744	5 Mar 1987	12:08:42.46	.061
745	5 Mar 1987	17:03:39.19	.059	746	5 Mar 1987	08:20:42.60	.057
747	5 Mar 1987	13:46:34.21	.057	748	27 Feb 1987	07:02:51.72	.056
749	5 Mar 1987	17:53:12.93	.056	750	27 Feb 1987	06:12:14.60	.056
751	5 Mar 1987	02:24:33.21	.055	752	5 Mar 1987	11:34:34.09	.054
753	5 Mar 1987	17:03:31.13	.053	754	5 Mar 1987	02:34:15.43	.053
755	5 Mar 1987	14:54:08.69	.053	756	5 Mar 1987	13:53:32.69	.052
757	27 Feb 1987	09:10:03.85	.052	758	5 Mar 1987	11:20:29.33	.052
759	5 Mar 1987	17:24:46.62	.051	760	27 Feb 1987	09:47:41.82	.050
761	5 Mar 1987	02:44:25.52	.050	762	27 Feb 1987	09:13:21.21	.050
763	5 Mar 1987	17:03:11.92	.049	764	5 Mar 1987	08:20:42.64	.049
765	27 Feb 1987	10:06:34.69	.048	766	5 Mar 1987	02:34:15.39	.047
767	5 Mar 1987	18:05:28.39	.045	768	5 Mar 1987	02:26:04.76	.045
769	5 Mar 1987	08:14:54.71	.044	770	5 Mar 1987	14:45:18.36	.044
771	5 Mar 1987	02:06:19.17	.044	772	5 Mar 1987	02:24:33.61	.044
773	5 Mar 1987	13:26:34.66	.043	774	5 Mar 1987	10:18:45.39	.043
775	5 Mar 1987	02:49:59.81	.043	776	5 Mar 1987	18:19:54.82	.042
777	27 Feb 1987	06:03:37.15	.042	778	5 Mar 1987	17:47:40.41	.040
779	5 Mar 1987	02:38:45.50	.039	780	27 Feb 1987	05:28:07.66	.038

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
781	27 Feb 1987	06:03:37.18	.038	782	27 Feb 1987	08:42:12.76	.038
783	5 Mar 1987	14:50:38.69	.037	784	5 Mar 1987	00:45:37.76	.037
785	5 Mar 1987	00:30:43.58	.035	786	5 Mar 1987	08:03:42.83	.034
787	5 Mar 1987	02:05:53.97	.034	788	27 Feb 1987	06:24:09.84	.034
789	5 Mar 1987	02:38:45.40	.033	790	27 Feb 1987	09:38:34.62	.033
791	5 Mar 1987	10:18:37.07	.033	792	5 Mar 1987	07:36:12.39	.032
793	5 Mar 1987	10:22:24.93	.032	794	5 Mar 1987	08:03:42.89	.031
795	5 Mar 1987	00:30:43.58	.031	796	5 Mar 1987	01:41:38.76	.031
797	5 Mar 1987	13:07:40.05	.031	798	26 Feb 1987	19:19:38.76	.030
799	5 Mar 1987	01:57:30.79	.030	800	5 Mar 1987	14:49:14.17	.030
801	5 Mar 1987	11:17:17.84	.030	802	5 Mar 1987	08:52:32.09	.030
803	5 Mar 1987	17:47:42.50	.029	804	5 Mar 1987	08:05:35.40	.029
805	27 Feb 1987	09:59:07.09	.029	806	5 Mar 1987	00:32:36.64	.028
807	5 Mar 1987	08:20:42.51	.028	808	5 Mar 1987	02:34:15.39	.027
809	27 Feb 1987	07:13:54.75	.027	810	5 Mar 1987	12:36:49.49	.027
811	26 Feb 1987	18:36:43.18	.027	812	26 Feb 1987	13:46:31.67	.026
813	5 Mar 1987	08:53:10.21	.026	814	5 Mar 1987	10:18:45.58	.026
815	5 Mar 1987	17:51:17.12	.026	816	5 Mar 1987	14:02:52.92	.025
817	27 Feb 1987	06:22:55.68	.025	818	27 Feb 1987	09:50:44.07	.025
819	5 Mar 1987	08:20:42.60	.025	820	5 Mar 1987	17:24:44.71	.024
821	5 Mar 1987	02:09:16.17	.024	822	5 Mar 1987	01:10:27.36	.024
823	27 Feb 1987	08:05:04.81	.023	824	5 Mar 1987	17:44:47.63	.023
825	5 Mar 1987	02:53:30.79	.023	826	5 Mar 1987	17:34:46.52	.023
827	27 Feb 1987	06:22:55.50	.023	828	5 Mar 1987	07:32:19.93	.022
829	5 Mar 1987	02:10:55.04	.022	830	27 Feb 1987	08:20:02.84	.022
831	27 Feb 1987	09:14:28.38	.022	832	5 Mar 1987	07:47:36.49	.022
833	5 Mar 1987	02:24:05.40	.021	834	5 Mar 1987	01:13:17.87	.021
835	5 Mar 1987	07:35:14.59	.021	836	5 Mar 1987	02:53:54.01	.020
837	5 Mar 1987	00:32:36.64	.020	838	5 Mar 1987	00:32:36.64	.020
839	5 Mar 1987	08:55:05.82	.020	840	5 Mar 1987	08:14:54.75	.020
841	27 Feb 1987	07:12:54.71	.020	842	27 Feb 1987	06:12:14.58	.019
843	5 Mar 1987	01:55:13.13	.019	844	27 Feb 1987	09:47:41.82	.019
845	5 Mar 1987	07:41:24.21	.018	846	5 Mar 1987	07:32:20.18	.018
847	27 Feb 1987	09:46:23.21	.018	848	5 Mar 1987	00:58:56.16	.018
849	27 Feb 1987	05:27:30.10	.018	850	5 Mar 1987	07:47:53.61	.017
851	5 Mar 1987	14:01:13.31	.017	852	27 Feb 1987	08:19:51.65	.017
853	27 Feb 1987	07:12:54.72	.017	854	5 Mar 1987	08:16:09.64	.016
855	5 Mar 1987	00:47:29.84	.016	856	5 Mar 1987	02:51:23.47	.016
857	5 Mar 1987	17:03:39.52	.016	858	5 Mar 1987	17:02:06.98	.015
859	5 Mar 1987	02:26:04.57	.015	860	5 Mar 1987	08:57:27.17	.014
861	5 Mar 1987	17:34:46.52	.013	862	5 Mar 1987	17:34:46.63	.013
863	5 Mar 1987	09:00:57.99	.013	864	5 Mar 1987	17:21:07.75	.013
865	5 Mar 1987	08:47:56.11	.013	866	5 Mar 1987	17:30:36.98	.013
867	27 Feb 1987	10:12:46.94	.012	868	5 Mar 1987	14:02:52.92	.012
869	5 Mar 1987	00:34:41.48	.012	870	5 Mar 1987	01:03:14.46	.012
871	5 Mar 1987	08:52:27.74	.012	872	27 Feb 1987	10:17:45.59	.011
873	5 Mar 1987	00:32:36.64	.011	874	5 Mar 1987	02:34:44.95	.011
875	5 Mar 1987	10:09:44.56	.011	876	5 Mar 1987	02:51:18.79	.011
877	5 Mar 1987	08:20:42.51	.011	878	5 Mar 1987	17:47:42.52	.010
879	26 Feb 1987	18:27:00.62	.010	880	5 Mar 1987	17:11:38.11	.010
881	5 Mar 1987	17:03:31.14	.010	882	5 Mar 1987	02:34:40.87	.010
883	5 Mar 1987	02:43:03.27	.010	884	5 Mar 1987	09:01:24.66	.010
885	5 Mar 1987	02:46:50.66	.010	886	27 Feb 1987	10:17:45.59	.010
887	5 Mar 1987	01:17:28.35	.009	888	5 Mar 1987	10:14:15.19	.009
889	5 Mar 1987	00:35:36.39	.009	890	5 Mar 1987	14:58:01.75	.009
891	5 Mar 1987	00:35:36.68	.009	892	5 Mar 1987	15:00:31.52	.008
893	27 Feb 1987	10:17:45.59	.008	894	5 Mar 1987	02:51:18.81	.008
895	5 Mar 1987	09:01:00.34	.008	896	5 Mar 1987	01:05:39.59	.008
897	5 Mar 1987	00:47:29.84	.008	898	27 Feb 1987	05:01:26.12	.008
899	5 Mar 1987	01:55:12.13	.008	900	5 Mar 1987	02:34:40.87	.008
901	5 Mar 1987	17:24:44.64	.008	902	5 Mar 1987	17:30:36.98	.008
903	5 Mar 1987	17:03:31.14	.008	904	5 Mar 1987	07:54:56.75	.007
905	5 Mar 1987	14:02:52.92	.007	906	5 Mar 1987	02:24:07.11	.007
907	5 Mar 1987	15:00:31.52	.007	908	5 Mar 1987	17:21:07.75	.007
909	5 Mar 1987	02:49:59.81	.007	910	5 Mar 1987	15:00:31.52	.007

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Used	Used	Not Used
Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Panel Pressures for the above Panels

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
911	5 Mar 1987	00:53:43.72	.007	912	5 Mar 1987	08:19:35.90	.007
913	5 Mar 1987	08:19:35.90	.007	914	5 Mar 1987	02:34:41.07	.006
915	5 Mar 1987	00:34:41.48	.006	916	5 Mar 1987	08:31:12.42	.006
917	5 Mar 1987	00:31:00.11	.006	918	5 Mar 1987	07:47:32.79	.006
919	5 Mar 1987	12:33:47.91	.006	920	5 Mar 1987	12:48:39.92	.006
921	5 Mar 1987	17:19:04.06	.006	922	5 Mar 1987	17:19:04.06	.005
923	5 Mar 1987	00:59:24.84	.005	924	5 Mar 1987	01:15:35.32	.005
925	5 Mar 1987	01:06:28.24	.005	926	5 Mar 1987	02:34:41.12	.005
927	27 Feb 1987	08:56:28.32	.005	928	5 Mar 1987	01:06:28.24	.005
929	5 Mar 1987	17:19:04.13	.005	930	26 Feb 1987	19:46:23.81	.005
931	5 Mar 1987	08:19:35.90	.005	932	5 Mar 1987	17:19:04.88	.005
933	5 Mar 1987	08:05:35.40	.005	934	5 Mar 1987	14:23:27.19	.005
935	5 Mar 1987	17:19:04.88	.005	936	5 Mar 1987	00:32:36.64	.005
937	5 Mar 1987	17:34:39.52	.005	938	5 Mar 1987	09:01:13.08	.005
939	5 Mar 1987	17:19:04.88	.005	940	5 Mar 1987	01:15:35.32	.005
941	5 Mar 1987	01:15:35.65	.005	942	5 Mar 1987	01:12:44.36	.004
943	5 Mar 1987	17:47:39.73	.004	944	5 Mar 1987	08:00:50.50	.004
945	5 Mar 1987	17:19:04.88	.004	946	5 Mar 1987	07:32:44.93	.004
947	5 Mar 1987	17:34:43.85	.004	948	5 Mar 1987	02:09:16.17	.004
949	5 Mar 1987	08:19:37.60	.004	950	5 Mar 1987	01:13:17.87	.004
951	5 Mar 1987	00:47:29.84	.004	952	5 Mar 1987	17:12:42.25	.004
953	5 Mar 1987	17:34:38.03	.004	954	5 Mar 1987	17:34:39.50	.003
955	5 Mar 1987	00:51:01.19	.003	956	5 Mar 1987	00:35:36.40	.003
957	5 Mar 1987	00:59:24.84	.003	958	5 Mar 1987	07:47:32.79	.003
959	5 Mar 1987	17:24:44.65	.003	960	5 Mar 1987	17:24:44.47	.003
961	5 Mar 1987	08:19:36.43	.003	962	5 Mar 1987	00:59:24.84	.002
963	5 Mar 1987	17:34:44.04	.002	964	5 Mar 1987	17:21:07.75	.002
965	5 Mar 1987	14:50:56.12	.002	966	27 Feb 1987	08:04:18.04	.002
967	5 Mar 1987	00:59:24.84	.002	968	5 Mar 1987	00:37:48.33	.002
969	5 Mar 1987	17:19:04.88	.002	970	5 Mar 1987	18:06:48.83	.002
971	5 Mar 1987	07:47:32.79	.002	972	5 Mar 1987	01:07:43.12	.002
973	5 Mar 1987	00:31:08.73	.002	974	5 Mar 1987	07:47:26.85	.002
975	5 Mar 1987	00:37:48.33	.001	976	5 Mar 1987	17:47:42.52	.001
977	5 Mar 1987	00:35:36.49	.001	978	5 Mar 1987	00:59:24.84	-0.000
979	5 Mar 1987	17:24:50.64	-.002	980	26 Feb 1987	18:28:12.87	-.010

AVERAGE FRAME PRESSURE ON ALL 'GOOD' PANELS ON FRAME 61.5 (RANKING THE PEAK SPATIAL AVERAGE FOR EACH EIGHT MINUTE WINDOW)

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	12	12.2
2	.050	.100	21	21.4
3	.100	.150	24	24.5
4	.150	.200	16	16.3
5	.200	.250	11	11.2
6	.250	.300	4	4.1
7	.300	.350	4	4.1
8	.350	.400	2	2.0
9	.400	.450	3	3.1
10	.450	.500	1	1.0
Total			98	100.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used

The Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	5 Mar 1987	10:36:45.82	.457	2	5 Mar 1987	11:40:24.61	.442
3	27 Feb 1987	09:39:27.78	.440	4	27 Feb 1987	07:50:55.07	.432
5	5 Mar 1987	14:35:36.19	.367	6	5 Mar 1987	12:38:57.33	.360
7	5 Mar 1987	12:26:35.30	.343	8	5 Mar 1987	08:55:05.82	.331
9	5 Mar 1987	01:13:17.84	.317	10	5 Mar 1987	02:03:30.85	.310
11	5 Mar 1987	17:53:30.72	.298	12	5 Mar 1987	10:27:21.46	.286
13	5 Mar 1987	13:29:28.43	.281	14	5 Mar 1987	12:05:24.72	.268
15	5 Mar 1987	13:34:59.07	.240	16	5 Mar 1987	12:20:18.06	.234
17	5 Mar 1987	14:17:08.25	.231	18	5 Mar 1987	17:47:39.68	.231
19	5 Mar 1987	14:46:47.37	.227	20	5 Mar 1987	13:04:20.92	.226
21	5 Mar 1987	10:44:41.85	.215	22	5 Mar 1987	01:55:12.14	.213
23	5 Mar 1987	12:47:11.02	.213	24	5 Mar 1987	10:56:12.44	.205
25	27 Feb 1987	06:23:26.39	.203	26	5 Mar 1987	12:59:32.06	.199
27	5 Mar 1987	18:20:03.59	.191	28	26 Feb 1987	18:36:42.93	.187
29	5 Mar 1987	11:09:53.10	.186	30	27 Feb 1987	07:03:38.04	.185
31	27 Feb 1987	05:45:21.72	.184	32	27 Feb 1987	08:42:12.76	.178
33	5 Mar 1987	01:41:18.86	.178	34	5 Mar 1987	13:51:59.15	.177
35	5 Mar 1987	10:02:55.36	.172	36	27 Feb 1987	05:58:28.14	.170
37	5 Mar 1987	00:32:36.67	.166	38	5 Mar 1987	11:34:34.00	.164
39	5 Mar 1987	11:06:57.65	.162	40	27 Feb 1987	07:59:29.92	.157
41	27 Feb 1987	04:45:07.56	.153	42	5 Mar 1987	02:43:09.18	.149
43	25 Feb 1987	07:26:24.08	.147	44	5 Mar 1987	11:20:21.94	.141
45	27 Feb 1987	08:24:53.61	.140	46	26 Feb 1987	18:45:49.21	.138
47	27 Feb 1987	09:06:44.82	.136	48	27 Feb 1987	09:48:05.45	.135
49	27 Feb 1987	07:41:36.62	.134	50	5 Mar 1987	08:05:54.64	.132
51	26 Feb 1987	19:47:01.70	.130	52	27 Feb 1987	06:40:13.59	.130
53	27 Feb 1987	05:01:25.99	.125	54	5 Mar 1987	14:25:05.07	.125
55	27 Feb 1987	07:09:02.93	.125	56	5 Mar 1987	07:56:20.32	.123
57	27 Feb 1987	06:13:02.09	.119	58	26 Feb 1987	18:59:09.17	.117
59	27 Feb 1987	08:50:38.10	.116	60	5 Mar 1987	17:24:44.34	.115
61	27 Feb 1987	09:13:21.21	.115	62	26 Feb 1987	19:39:29.74	.114
63	26 Feb 1987	18:16:27.59	.113	64	5 Mar 1987	07:36:03.96	.108
65	5 Mar 1987	02:25:57.01	.102	66	5 Mar 1987	02:10:49.70	.099
67	5 Mar 1987	10:12:28.82	.098	68	5 Mar 1987	18:15:32.74	.097
69	5 Mar 1987	18:01:59.15	.097	70	5 Mar 1987	08:33:50.74	.096
71	5 Mar 1987	00:51:01.19	.095	72	26 Feb 1987	18:28:18.97	.091
73	27 Feb 1987	10:05:30.81	.090	74	27 Feb 1987	06:06:46.55	.090
75	5 Mar 1987	17:03:39.45	.086	76	27 Feb 1987	08:38:54.24	.085
77	27 Feb 1987	10:19:55.28	.080	78	5 Mar 1987	13:44:46.18	.077
79	5 Mar 1987	00:35:36.45	.072	80	5 Mar 1987	08:15:13.01	.070
81	26 Feb 1987	19:15:24.63	.065	82	26 Feb 1987	19:23:42.96	.065
83	27 Feb 1987	10:01:09.04	.059	84	5 Mar 1987	14:04:05.98	.055
85	5 Mar 1987	02:34:41.07	.053	86	27 Feb 1987	08:05:04.83	.053
87	5 Mar 1987	14:54:08.69	.044	88	5 Mar 1987	09:01:10.67	.044
89	5 Mar 1987	02:54:14.62	.042	90	5 Mar 1987	01:09:42.40	.042
91	27 Feb 1987	08:13:28.43	.040	92	27 Feb 1987	05:25:13.67	.037
93	5 Mar 1987	07:47:36.49	.027	94	5 Mar 1987	00:58:56.19	.016
95	5 Mar 1987	15:05:50.89	.015	96	5 Mar 1987	08:27:15.35	.011
97	5 Mar 1987	17:34:33.81	.007	98	5 Mar 1987	17:19:04.13	.005

AVERAGE FRAME PRESSURE ON ALL 'GOOD'
PANELS ABOVE THE STRINGER ON FRAME 61.5
(RANKING THE PEAK SPATIAL AVERAGE
FOR EACH EIGHT MINUTE WINDOW)

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	6	6.1
2	.050	.100	6	6.1
3	.100	.150	8	8.2
4	.150	.200	10	10.2
5	.200	.250	8	8.2
6	.250	.300	11	11.2
7	.300	.350	11	11.2
8	.350	.400	6	6.1
9	.400	.450	8	8.2
10	.450	.500	7	7.1
11	.500	.550	6	6.1
12	.550	.600	0	0.0
13	.600	.650	1	1.0
14	.650	.700	2	2.0
15	.700	.750	0	0.0
16	.750	.800	3	3.1
17	.800	.850	1	1.0
18	.850	.900	0	0.0
19	.900	.950	0	0.0
20	.950	1.000	0	0.0
21	1.000	1.050	3	3.1
22	1.050	1.100	1	1.0
Total			98	100.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	5 Mar	1987 10:36:45.82	1.081	2	27 Feb	1987 07:50:55.07	1.042
3	5 Mar	1987 12:38:57.35	1.021	4	5 Mar	1987 11:40:24.61	1.013
5	5 Mar	1987 08:55:05.82	.846	6	5 Mar	1987 14:35:36.21	.776
7	5 Mar	1987 02:01:08.85	.765	8	5 Mar	1987 12:26:35.30	.760
9	5 Mar	1987 01:13:17.84	.678	10	5 Mar	1987 17:53:30.72	.665
11	5 Mar	1987 10:29:01.89	.613	12	27 Feb	1987 09:42:57.64	.548
13	5 Mar	1987 13:34:59.07	.541	14	5 Mar	1987 12:05:24.72	.539
15	5 Mar	1987 13:04:20.92	.521	16	5 Mar	1987 11:09:53.10	.519
17	5 Mar	1987 17:47:39.68	.518	18	5 Mar	1987 18:20:03.59	.485
19	5 Mar	1987 14:17:08.25	.480	20	5 Mar	1987 14:46:47.37	.470
21	5 Mar	1987 12:47:11.11	.466	22	5 Mar	1987 11:24:50.75	.462
23	5 Mar	1987 12:59:32.06	.451	24	5 Mar	1987 00:32:36.67	.451
25	27 Feb	1987 04:45:07.56	.446	26	5 Mar	1987 10:04:49.17	.443
27	27 Feb	1987 08:42:59.75	.442	28	5 Mar	1987 10:56:12.44	.440
29	5 Mar	1987 13:27:20.48	.423	30	5 Mar	1987 12:21:57.49	.418
31	5 Mar	1987 01:41:18.86	.413	32	27 Feb	1987 05:57:26.64	.412
33	26 Feb	1987 19:47:01.70	.391	34	26 Feb	1987 18:45:49.21	.391
35	5 Mar	1987 13:51:59.15	.386	36	5 Mar	1987 02:43:09.18	.368
37	27 Feb	1987 07:09:02.93	.361	38	25 Feb	1987 07:26:24.08	.351
39	5 Mar	1987 10:47:59.58	.348	40	5 Mar	1987 10:12:28.82	.347
41	5 Mar	1987 11:06:57.65	.345	42	5 Mar	1987 08:05:54.64	.335
43	27 Feb	1987 06:25:18.75	.330	44	5 Mar	1987 00:35:36.45	.328
45	27 Feb	1987 07:59:29.92	.326	46	5 Mar	1987 11:35:21.70	.324
47	26 Feb	1987 19:39:29.74	.321	48	5 Mar	1987 07:55:08.43	.311
49	26 Feb	1987 18:59:09.17	.305	50	27 Feb	1987 08:24:53.61	.291
51	27 Feb	1987 04:53:52.75	.278	52	26 Feb	1987 18:34:48.87	.277
53	27 Feb	1987 09:02:41.99	.272	54	5 Mar	1987 17:03:39.45	.268
55	27 Feb	1987 07:41:36.62	.267	56	26 Feb	1987 18:16:55.68	.262
57	27 Feb	1987 08:50:38.10	.257	58	5 Mar	1987 14:25:05.07	.257
59	5 Mar	1987 02:10:51.42	.253	60	5 Mar	1987 17:24:44.34	.252
61	5 Mar	1987 18:01:59.15	.241	62	5 Mar	1987 07:36:03.96	.240
63	26 Feb	1987 18:28:18.97	.231	64	5 Mar	1987 18:15:32.74	.229
65	5 Mar	1987 08:33:50.74	.216	66	5 Mar	1987 02:25:57.01	.214
67	27 Feb	1987 10:19:55.28	.211	68	5 Mar	1987 00:51:01.19	.211
69	5 Mar	1987 13:46:05.43	.198	70	27 Feb	1987 09:15:02.10	.194
71	26 Feb	1987 19:15:24.63	.190	72	5 Mar	1987 14:04:05.98	.178
73	27 Feb	1987 05:48:24.06	.174	74	27 Feb	1987 06:01:43.48	.165
75	5 Mar	1987 02:34:46.47	.157	76	27 Feb	1987 06:15:25.41	.157
77	5 Mar	1987 08:15:13.01	.153	78	26 Feb	1987 19:23:45.17	.151
79	5 Mar	1987 14:49:37.87	.140	80	27 Feb	1987 07:04:47.13	.134
81	5 Mar	1987 01:54:47.68	.134	82	5 Mar	1987 09:01:10.67	.128
83	27 Feb	1987 10:05:35.66	.127	84	27 Feb	1987 06:44:52.92	.119
85	5 Mar	1987 01:09:42.40	.116	86	5 Mar	1987 02:53:54.01	.102
87	27 Feb	1987 05:28:09.47	.087	88	27 Feb	1987 08:36:18.93	.061
89	27 Feb	1987 09:57:36.93	.059	90	5 Mar	1987 07:47:26.75	.058
91	27 Feb	1987 09:47:23.07	.058	92	5 Mar	1987 15:05:47.06	.053
93	27 Feb	1987 08:15:26.17	.035	94	5 Mar	1987 17:34:33.81	.018
95	5 Mar	1987 08:27:15.35	.017	96	27 Feb	1987 08:03:22.45	.015
97	5 Mar	1967 01:01:02.45	.006	98	5 Mar	1987 17:19:05.32	.003

AVERAGE FRAME PRESSURE ON ALL 'GOOD'
PANELS BELOW THE STRINGER ON FRAME 61.5
(RANKING THE PEAK SPATIAL AVERAGE
FOR EACH EIGHT MINUTE WINDOW)

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	17	17.3
2	.050	.100	14	14.3
3	.100	.150	22	22.4
4	.150	.200	13	13.3
5	.200	.250	6	6.1
6	.250	.300	7	7.1
7	.300	.350	8	8.2
8	.350	.400	4	4.1
9	.400	.450	2	2.0
10	.450	.500	4	4.1
Total			97	99.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Used	Not Used

The Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	27 Feb 1987	09:39:27.78	.495	2	5 Mar 1987	10:27:21.46	.488
3	5 Mar 1987	13:29:28.43	.477	4	5 Mar 1987	01:55:12.14	.458
5	5 Mar 1987	11:45:19.59	.427	6	5 Mar 1987	01:41:38.76	.405
7	27 Feb 1987	05:58:28.14	.398	8	5 Mar 1987	10:51:05.92	.392
9	5 Mar 1987	10:41:06.28	.362	10	27 Feb 1987	09:13:21.21	.360
11	26 Feb 1987	18:36:42.93	.341	12	27 Feb 1987	05:45:21.72	.338
13	5 Mar 1987	12:20:18.06	.336	14	5 Mar 1987	10:03:11.08	.332
15	5 Mar 1987	13:33:26.92	.322	16	27 Feb 1987	07:45:10.09	.319
17	27 Feb 1987	07:03:38.04	.314	18	5 Mar 1987	11:34:15.19	.310
19	27 Feb 1987	08:42:12.76	.296	20	5 Mar 1987	12:49:21.38	.286
21	5 Mar 1987	07:56:20.25	.278	22	5 Mar 1987	14:37:01.44	.270
23	27 Feb 1987	05:01:25.95	.262	24	5 Mar 1987	11:06:34.17	.260
25	27 Feb 1987	06:23:26.38	.258	26	5 Mar 1987	12:30:19.05	.241
27	27 Feb 1987	06:03:37.17	.241	28	5 Mar 1987	11:17:17.74	.239
29	5 Mar 1987	10:37:47.30	.236	30	25 Feb 1987	07:27:49.05	.212
31	27 Feb 1987	06:13:02.09	.202	32	5 Mar 1987	08:52:27.74	.199
33	5 Mar 1987	08:03:42.79	.193	34	26 Feb 1987	18:48:58.55	.191
35	5 Mar 1987	17:47:40.41	.187	36	27 Feb 1987	06:40:13.59	.185
37	27 Feb 1987	09:48:05.45	.183	38	5 Mar 1987	11:20:21.94	.178
39	27 Feb 1987	09:06:45.39	.177	40	5 Mar 1987	14:45:18.36	.176
41	26 Feb 1987	18:16:27.59	.176	42	5 Mar 1987	12:33:47.91	.159
43	27 Feb 1987	08:56:30.40	.158	44	27 Feb 1987	07:39:27.01	.153
45	5 Mar 1987	13:04:25.36	.147	46	27 Feb 1987	08:38:54.24	.145
47	5 Mar 1987	18:23:59.65	.138	48	27 Feb 1987	04:50:43.79	.137
49	27 Feb 1987	07:56:58.66	.135	50	27 Feb 1987	09:59:06:43	.133
51	26 Feb 1987	19:19:20.30	.128	52	5 Mar 1987	18:12:36.81	.125
53	27 Feb 1987	10:05:30.81	.124	54	5 Mar 1987	13:53:32.62	.123
55	5 Mar 1987	14:14:11.18	.122	56	5 Mar 1987	12:06:02.33	.120
57	26 Feb 1987	18:53:57.68	.119	58	5 Mar 1987	12:55:44.49	.119
59	5 Mar 1987	13:44:46.18	.116	60	5 Mar 1987	02:01:53.86	.115
61	26 Feb 1987	19:46:31.67	.115	62	5 Mar 1987	07:32:19.93	.110
63	27 Feb 1987	08:24:04.19	.110	64	26 Feb 1987	19:41:30.79	.104
65	26 Feb 1987	19:26:52.64	.102	66	26 Feb 1987	18:28:25.28	.101
67	5 Mar 1987	14:26:10.32	.099	68	5 Mar 1987	17:51:17.12	.097
69	5 Mar 1987	10:18:45.39	.095	70	27 Feb 1987	07:14:07.18	.092
71	5 Mar 1987	08:30:56.21	.088	72	27 Feb 1987	08:05:04.83	.086
73	5 Mar 1987	02:43:05.48	.083	74	27 Feb 1987	10:20:37.47	.080
75	27 Feb 1987	05:25:37.00	.078	76	5 Mar 1987	08:14:54.68	.076
77	5 Mar 1987	02:26:04.47	.072	78	5 Mar 1987	14:54:08.69	.071
79	5 Mar 1987	18:03:51.72	.059	80	5 Mar 1987	02:10:05.90	.052
81	27 Feb 1987	08:13:28.42	.050	82	5 Mar 1987	14:03:13.17	.049
83	5 Mar 1987	07:47:36.49	.044	84	5 Mar 1987	00:47:29.47	.037
85	5 Mar 1987	17:03:31.04	.033	86	5 Mar 1987	09:01:00.34	.032
87	5 Mar 1987	15:05:45.23	.021	88	5 Mar 1987	17:24:46.62	.017
89	5 Mar 1987	08:20:42.51	.014	90	5 Mar 1987	02:51:18.79	.010
91	5 Mar 1987	00:32:36.64	.010	92	5 Mar 1987	02:34:40.87	.007
93	5 Mar 1987	01:15:35.32	.006	94	5 Mar 1987	01:06:28.24	.004
95	5 Mar 1987	17:19:04.06	.004	96	5 Mar 1987	17:34:43.85	.003
97	5 Mar 1987	00:59:24.84	.003	98	5 Mar 1987	00:37:48.33	-0.000

AVERAGE FRAME PRESSURE ON ALL 'GOOD' PANELS ON FRAME 59.5 (RANKING THE PEAK SPATIAL AVERAGE FOR EACH EIGHT MINUTE WINDOW)

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	5 Mar 1987	10:46:48.48	.442	2	27 Feb 1987	06:15:25.58	.408
3	5 Mar 1987	17:24:44.68	.405	4	5 Mar 1987	11:05:46.13	.352
5	5 Mar 1987	12:27:39.57	.350	6	25 Feb 1987	07:28:54.11	.340
7	5 Mar 1987	13:33:27.35	.332	8	5 Mar 1987	10:38:56.16	.316
9	5 Mar 1987	12:59:19.24	.279	10	5 Mar 1987	01:14:30.54	.268
11	5 Mar 1987	11:43:32.88	.266	12	27 Feb 1987	08:40:49.68	.253
13	5 Mar 1987	12:46:31.91	.252	14	5 Mar 1987	07:53:52.32	.249
15	5 Mar 1987	13:48:25.91	.248	16	27 Feb 1987	07:38:34.84	.240
17	5 Mar 1987	02:06:48.61	.238	18	27 Feb 1987	05:45:22.27	.237
19	5 Mar 1987	13:30:42.01	.235	20	5 Mar 1987	10:18:18.03	.230
21	27 Feb 1987	07:58:01.46	.229	22	26 Feb 1987	18:36:42.73	.206
23	5 Mar 1987	08:30:39.97	.204	24	27 Feb 1987	08:38:17.65	.204
25	27 Feb 1987	05:54:02.91	.198	26	5 Mar 1987	01:41:28.85	.197
27	27 Feb 1987	09:12:45.32	.182	28	5 Mar 1987	11:22:37.23	.181
29	27 Feb 1987	07:45:10.58	.178	30	5 Mar 1987	13:54:55.42	.178
31	5 Mar 1987	17:46:02.29	.178	32	27 Feb 1987	06:03:37.20	.173
33	5 Mar 1987	11:09:53.36	.172	34	5 Mar 1987	14:30:40.70	.168
35	5 Mar 1987	10:09:22.61	.167	36	5 Mar 1987	10:58:04.81	.160
37	5 Mar 1987	14:43:41.03	.159	38	5 Mar 1987	11:30:02.48	.152
39	5 Mar 1987	12:05:41.32	.151	40	27 Feb 1987	07:02:51.78	.150
41	5 Mar 1987	01:55:12.41	.149	42	5 Mar 1987	08:52:27.67	.148
43	5 Mar 1987	10:24:46.30	.143	44	5 Mar 1987	13:08:44.07	.141
45	27 Feb 1987	07:12:54.72	.139	46	27 Feb 1987	08:24:53.59	.136
47	5 Mar 1987	12:34:13.32	.136	48	5 Mar 1987	12:20:32.65	.134
49	5 Mar 1987	14:49:41.79	.133	50	5 Mar 1987	00:32:36.67	.130
51	27 Feb 1987	09:05:57.96	.126	52	27 Feb 1987	06:24:10.11	.126
53	5 Mar 1987	02:09:04.12	.124	54	26 Feb 1987	18:58:03.59	.123
55	5 Mar 1987	17:56:33.94	.121	56	5 Mar 1987	18:04:13.15	.117
57	5 Mar 1987	18:14:12.75	.114	58	5 Mar 1987	09:00:51.55	.112
59	5 Mar 1987	18:21:41.50	.110	60	5 Mar 1987	14:27:14.13	.105
61	5 Mar 1987	02:44:25.86	.104	62	26 Feb 1987	19:46:23.87	.103
63	27 Feb 1987	08:57:54.14	.101	64	5 Mar 1987	07:32:34.99	.098
65	5 Mar 1987	00:37:48.33	.095	66	27 Feb 1987	05:00:09.85	.089
67	5 Mar 1987	14:11:27.23	.087	68	27 Feb 1987	06:42:16.48	.084
69	26 Feb 1987	18:50:38.06	.084	70	5 Mar 1987	02:51:46.97	.084
71	27 Feb 1987	08:04:18.01	.083	72	27 Feb 1987	09:59:07.10	.083
73	27 Feb 1987	08:13:28.62	.082	74	5 Mar 1987	08:06:03.87	.081
75	27 Feb 1987	09:43:10.16	.080	76	27 Feb 1987	10:20:20.79	.075
77	26 Feb 1987	19:24:42.89	.075	78	5 Mar 1987	00:58:56.22	.072
79	5 Mar 1987	14:01:13.31	.072	80	26 Feb 1987	19:14:56.08	.071
81	5 Mar 1987	07:47:51.13	.071	82	26 Feb 1987	18:30:54.91	.068
83	26 Feb 1987	18:21:01.16	.067	84	27 Feb 1987	09:47:34.82	.066
85	27 Feb 1987	10:08:27.45	.062	86	27 Feb 1987	04:44:59.22	.049
87	27 Feb 1987	05:29:05.83	.043	88	5 Mar 1987	15:05:45.63	.042
89	5 Mar 1987	08:16:09.82	.041	90	5 Mar 1987	02:34:30.40	.040
91	5 Mar 1987	00:46:12.51	.040	92	5 Mar 1987	17:03:28.92	.032
93	5 Mar 1987	02:24:17.64	.026	94	26 Feb 1987	19:41:31.13	.019
95	5 Mar 1987	17:34:45.90	.014	96	5 Mar 1987	01:09:13.93	.014
97	5 Mar 1987	08:19:36.31	.004	98	5 Mar 1987	17:11:38.12	.003

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	13	13.3
2	.050	.100	22	22.4
3	.100	.150	24	24.5
4	.150	.200	15	15.3
5	.200	.250	11	11.2
6	.250	.300	5	5.1
7	.300	.350	4	4.1
8	.350	.400	1	1.0
9	.400	.450	3	3.1
Total			98	100.0

AVERAGE FRAME PRESSURE ON ALL 'GOOD'
PANELS ABOVE THE STRINGER ON FRAME 59.5
(RANKING THE PEAK SPATIAL AVERAGE FOR
EACH EIGHT MINUTE WINDOW)

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	4	4.1
2	.050	.100	6	6.1
3	.100	.150	7	7.1
4	.150	.200	2	2.0
5	.200	.250	5	5.1
6	.250	.300	7	7.1
7	.300	.350	9	9.2
8	.350	.400	6	6.1
9	.400	.450	9	9.2
10	.450	.500	5	5.1
11	.500	.550	4	4.1
12	.550	.600	3	3.1
13	.600	.650	5	5.1
14	.650	.700	3	3.1
15	.700	.750	3	3.1
16	.750	.800	5	5.1
17	.800	.850	1	1.0
18	.850	.900	1	1.0
19	.900	.950	1	1.0
20	.950	1.000	3	3.1
21	1.000	1.050	2	2.0
22	1.050	1.100	1	1.0
23	1.100	1.150	1	1.0
24	1.150	1.200	2	2.0
25	1.200	1.250	1	1.0
26	1.250	1.300	0	0.0
27	1.300	1.350	1	1.0
28	1.350	1.400	1	1.0
Total			98	100.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	5 Mar 1987	17:24:44.65	1.396	2	5 Mar 1987	10:46:48.48	1.317
3	5 Mar 1987	11:05:46.13	1.207	4	27 Feb 1987	06:15:25.58	1.175
5	5 Mar 1987	02:06:48.61	1.165	6	27 Feb 1987	08:00:50.21	1.115
7	5 Mar 1987	10:38:56.16	1.068	8	5 Mar 1987	01:47:21.46	1.003
9	5 Mar 1987	12:59:19.24	1.003	10	5 Mar 1987	11:43:32.88	.996
11	5 Mar 1987	12:27:39.57	.977	12	5 Mar 1987	01:14:30.54	.959
13	5 Mar 1987	13:27:13.12	.902	14	27 Feb 1987	06:03:08.36	.868
15	5 Mar 1987	10:10:01.00	.809	16	5 Mar 1987	13:48:25.91	.799
17	5 Mar 1987	07:53:52.32	.787	18	27 Feb 1987	07:38:34.84	.770
19	27 Feb 1987	07:43:50.96	.757	20	26 Feb 1987	18:58:03.59	.751
21	5 Mar 1987	10:58:04.81	.733	22	26 Feb 1987	18:51:30.20	.720
23	25 Feb 1987	07:27:56.82	.714	24	5 Mar 1987	11:22:37.23	.697
25	5 Mar 1987	08:52:27.67	.694	26	5 Mar 1987	10:18:18.03	.690
27	5 Mar 1987	11:09:53.38	.628	28	5 Mar 1987	12:46:31.91	.625
29	5 Mar 1987	13:32:51.25	.611	30	5 Mar 1987	12:38:16.86	.610
31	5 Mar 1987	00:32:36.67	.605	32	26 Feb 1987	18:20:45.60	.590
33	5 Mar 1987	14:35:20.67	.575	34	5 Mar 1987	08:30:39.97	.567
35	5 Mar 1987	14:27:14.08	.533	36	26 Feb 1987	19:19:27.18	.527
37	5 Mar 1987	12:05:41.32	.518	38	5 Mar 1987	13:09:52.57	.505
39	5 Mar 1987	10:23:56.11	.491	40	5 Mar 1987	14:42:37.25	.488
41	5 Mar 1987	17:57:26.28	.482	42	27 Feb 1987	04:44:21.40	.456
43	27 Feb 1987	05:54:58.74	.454	44	27 Feb 1987	05:42:23.36	.436
45	5 Mar 1987	12:18:41.49	.427	46	5 Mar 1987	13:54:50.57	.422
47	5 Mar 1987	11:30:02.48	.420	48	5 Mar 1987	17:46:02.29	.419
49	26 Feb 1987	18:25:24.84	.419	50	26 Feb 1987	19:26:37.03	.417
51	5 Mar 1987	02:09:04.12	.415	52	5 Mar 1987	18:04:13.15	.400
53	26 Feb 1987	18:40:46.03	.377	54	26 Feb 1987	19:47:15.72	.375
55	5 Mar 1987	07:47:53.57	.366	56	5 Mar 1987	14:49:41.79	.361
57	27 Feb 1987	08:03:39.72	.360	58	27 Feb 1987	05:29:05.83	.359
59	27 Feb 1987	08:24:53.59	.336	60	5 Mar 1987	01:50:31.12	.329
61	27 Feb 1987	09:05:57.96	.317	62	27 Feb 1987	08:48:17.30	.315
63	5 Mar 1987	18:14:12.75	.314	64	5 Mar 1987	18:22:22.20	.313
65	5 Mar 1987	14:16:05.91	.312	66	27 Feb 1987	06:25:45.13	.311
67	26 Feb 1987	19:41:33.27	.305	68	27 Feb 1987	08:17:47.80	.295
69	5 Mar 1987	09:00:51.55	.282	70	27 Feb 1987	10:08:27.45	.268
71	5 Mar 1987	07:32:34.99	.263	72	27 Feb 1987	10:20:20.79	.256
73	5 Mar 1987	02:50:50.90	.253	74	5 Mar 1987	02:39:57.61	.252
75	5 Mar 1987	08:04:04.54	.242	76	27 Feb 1987	08:51:28.20	.241
77	27 Feb 1987	09:48:12.35	.237	78	5 Mar 1987	02:34:30.40	.231
79	5 Mar 1987	14:01:13.31	.226	80	27 Feb 1987	07:05:01.19	.168
81	27 Feb 1987	09:43:32.96	.165	82	27 Feb 1987	07:10:14.18	.141
83	5 Mar 1987	01:00:13.06	.133	84	5 Mar 1987	17:03:19.20	.120
85	27 Feb 1987	09:10:15.93	.119	86	27 Feb 1987	04:55:29.09	.115
87	5 Mar 1987	00:45:27.39	.105	88	5 Mar 1987	17:34:45.90	.105
89	27 Feb 1987	09:57:55.63	.095	90	5 Mar 1987	08:14:55.50	.095
91	5 Mar 1987	00:37:11.35	.079	92	5 Mar 1987	02:24:17.64	.074
93	5 Mar 1987	15:05:47.74	.066	94	27 Feb 1987	06:41:27.62	.059
95	27 Feb 1987	08:34:45.73	.045	96	5 Mar 1987	01:10:37.74	.040
97	5 Mar 1987	08:20:23.95	.011	98	5 Mar 1987	17:11:38.12	.002

AVERAGE FRAME PRESSURE ON ALL 'GOOD'
PANELS BELOW THE STRINGER ON FRAME 59.5
(RANKING THE PEAK SPATIAL AVERAGE FOR
EACH EIGHT MINUTE WINDOW)

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	4	4.1
2	.050	.100	3	3.1
3	.100	.150	6	6.1
4	.150	.200	10	10.2
5	.200	.250	9	9.2
6	.250	.300	13	13.3
7	.300	.350	8	8.2
8	.350	.400	8	8.2
9	.400	.450	4	4.1
10	.450	.500	7	7.1
11	.500	.550	6	6.1
12	.550	.600	3	3.1
13	.600	.650	6	6.1
14	.650	.700	5	5.1
15	.700	.750	4	4.1
16	.750	.800	1	1.0
17	.800	.850	1	1.0
Total			98	100.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)
1	5 Mar 1987	13:33:27.35	.807
3	5 Mar 1987	13:30:42.02	.730
5	27 Feb 1987	07:35:28.71	.714
7	26 Feb 1987	18:36:42.72	.685
9	27 Feb 1987	05:54:02.93	.665
11	5 Mar 1987	11:29:56.19	.656
13	5 Mar 1987	11:04:11.67	.642
15	27 Feb 1987	05:45:22.27	.611
17	5 Mar 1987	13:06:23.53	.601
19	27 Feb 1987	09:16:13.86	.586
21	27 Feb 1987	06:04:06.87	.546
23	27 Feb 1987	08:38:17.65	.540
25	5 Mar 1987	13:54:55.42	.522
27	25 Feb 1987	07:29:41.06	.493
29	5 Mar 1987	10:37:34.84	.488
31	5 Mar 1987	01:41:39.25	.477
33	5 Mar 1987	12:38:14.91	.450
35	27 Feb 1987	08:53:59.01	.438
37	5 Mar 1987	13:46:03.80	.411
39	27 Feb 1987	09:00:20.54	.394
41	5 Mar 1987	10:18:19.16	.383
43	5 Mar 1987	12:21:48.52	.375
45	5 Mar 1987	14:11:42.91	.353
47	26 Feb 1987	18:57:45.57	.344
49	5 Mar 1987	00:37:48.33	.316
51	27 Feb 1987	06:24:10.11	.309
53	5 Mar 1987	18:06:48.83	.305
55	27 Feb 1987	04:44:38.65	.294
57	27 Feb 1987	06:11:23.67	.290
59	5 Mar 1987	00:32:36.90	.284
61	27 Feb 1987	08:13:28.62	.280
63	27 Feb 1987	08:04:18.01	.268
65	27 Feb 1987	07:12:55.04	.254
67	27 Feb 1987	09:46:13.94	.237
69	26 Feb 1987	18:28:25.75	.228
71	27 Feb 1987	09:59:07.10	.223
73	5 Mar 1987	00:58:56.22	.216
75	26 Feb 1987	19:17:37.13	.211
77	26 Feb 1987	19:41:31.13	.199
79	5 Mar 1987	14:26:10.88	.184
81	5 Mar 1987	08:16:09.82	.171
83	27 Feb 1987	09:42:30.76	.158
85	5 Mar 1987	01:15:35.56	.151
87	5 Mar 1987	14:02:54.26	.143
89	5 Mar 1987	00:46:12.51	.130
91	27 Feb 1987	10:06:34.69	.116
93	5 Mar 1987	02:34:15.72	.057
95	5 Mar 1987	01:09:13.98	.040
97	5 Mar 1987	17:19:04.88	.004

No.	Date	Time	Press (MPa)
2	5 Mar 1987	11:45:19.89	.798
4	5 Mar 1987	17:47:40.72	.722
6	27 Feb 1987	08:40:49.68	.703
8	5 Mar 1987	11:13:37.67	.674
10	27 Feb 1987	07:02:51.78	.661
12	5 Mar 1987	01:55:13.30	.648
14	5 Mar 1987	18:18:37.36	.618
16	5 Mar 1987	12:26:22.48	.604
18	27 Feb 1987	07:58:01.47	.599
20	5 Mar 1987	07:54:56.84	.557
22	5 Mar 1987	10:46:35.94	.544
24	27 Feb 1987	07:45:10.58	.536
26	5 Mar 1987	12:47:11.68	.512
28	5 Mar 1987	08:06:03.94	.491
30	5 Mar 1987	11:19:52.30	.485
32	26 Feb 1987	19:46:23.87	.472
34	5 Mar 1987	14:39:41.97	.449
36	5 Mar 1987	12:54:50.80	.423
38	26 Feb 1987	18:48:48.00	.399
40	5 Mar 1987	14:50:38.28	.387
42	5 Mar 1987	17:56:33.94	.376
44	5 Mar 1987	10:27:42.42	.354
46	5 Mar 1987	10:02:59.21	.346
48	26 Feb 1987	18:21:01.16	.322
50	5 Mar 1987	02:44:25.86	.313
52	27 Feb 1987	10:17:45.59	.307
54	26 Feb 1987	19:23:13.52	.295
56	27 Feb 1987	05:00:09.85	.291
58	5 Mar 1987	18:09:22.61	.288
60	5 Mar 1987	10:57:08.34	.282
62	5 Mar 1987	08:33:51.12	.276
64	5 Mar 1987	08:53:10.21	.254
66	5 Mar 1987	14:35:49.59	.250
68	5 Mar 1987	07:33:05.51	.232
70	5 Mar 1987	02:06:19.23	.227
72	5 Mar 1987	12:08:41.50	.218
74	27 Feb 1987	06:42:20.71	.214
76	5 Mar 1987	15:05:45.00	.199
78	27 Feb 1987	08:21:49.35	.192
80	5 Mar 1987	09:01:33.20	.176
82	5 Mar 1987	17:03:28.99	.160
84	27 Feb 1987	05:29:20.36	.153
86	5 Mar 1987	17:24:45.44	.145
88	5 Mar 1987	02:10:06.66	.133
90	5 Mar 1987	02:53:44.34	.121
92	5 Mar 1987	07:47:33.02	.084
94	5 Mar 1987	02:24:33.97	.056
96	5 Mar 1987	17:34:46.52	.018
98	5 Mar 1987	08:19:35.90	.004

AVERAGE FOUR PANEL PRESSURE ON
PANELS #17, 18, 23 AND 24
(RANKING THE PEAK SPATIAL AVERAGE
FOR EACH EIGHT MINUTE WINDOW)

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Used	Used	Not Used	Not Used
Not Used	Not Used	Used	Used	Not Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	17	17.3
2	.050	.100	18	18.4
3	.100	.150	20	20.4
4	.150	.200	16	16.3
5	.200	.250	9	9.2
6	.250	.300	6	6.1
7	.300	.350	5	5.1
8	.350	.400	3	3.1
9	.400	.450	1	1.0
10	.450	.500	1	1.0
11	.500	.550	0	0.0
12	.550	.600	1	1.0
Total			97	99.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Used	Used	Not Used	Not Used
Not Used	Not Used	Used	Used	Not Used	Not Used

The Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	27 Feb 1987	09:39:27.82	.586	2	5 Mar 1987	13:33:27.11	.474
3	27 Feb 1987	07:37:07.09	.407	4	27 Feb 1987	05:43:53.18	.396
5	5 Mar 1987	01:55:12.21	.368	6	25 Feb 1987	07:28:24.13	.356
7	27 Feb 1987	04:50:43.91	.336	8	5 Mar 1987	10:51:05.99	.319
9	5 Mar 1987	01:41:38.97	.316	10	5 Mar 1987	10:44:41.96	.315
11	5 Mar 1987	12:20:18.26	.309	12	5 Mar 1987	13:29:28.49	.287
13	5 Mar 1987	12:30:18.88	.276	14	5 Mar 1987	11:35:54.23	.259
15	27 Feb 1987	07:50:52.94	.258	16	5 Mar 1987	11:11:25.74	.254
17	27 Feb 1987	07:54:57.28	.251	18	5 Mar 1987	14:37:01.47	.247
19	26 Feb 1987	18:36:43.18	.236	20	5 Mar 1987	12:49:21.58	.235
21	27 Feb 1987	09:06:45.03	.220	22	27 Feb 1987	08:42:12.89	.215
23	5 Mar 1987	18:09:13.98	.212	24	5 Mar 1987	11:42:41.97	.211
25	5 Mar 1987	11:04:24.76	.209	26	5 Mar 1987	10:22:24.92	.208
27	27 Feb 1987	08:50:29.42	.194	28	27 Feb 1987	08:36:37.44	.184
29	26 Feb 1987	19:24:42.56	.182	30	27 Feb 1987	06:07:23.71	.182
31	5 Mar 1987	13:54:55.23	.180	32	5 Mar 1987	10:38:05.70	.175
33	27 Feb 1987	06:24:09.84	.166	34	27 Feb 1987	05:55:38.05	.165
35	5 Mar 1987	02:26:04.57	.165	36	5 Mar 1987	13:46:03.48	.162
37	26 Feb 1987	18:28:25.38	.160	38	5 Mar 1987	10:02:59.07	.159
39	27 Feb 1987	07:13:54.75	.158	40	26 Feb 1987	18:46:50.66	.155
41	5 Mar 1987	11:20:29.46	.154	42	27 Feb 1987	06:40:17.64	.152
43	27 Feb 1987	10:05:30.85	.149	44	26 Feb 1987	18:16:27.66	.149
45	26 Feb 1987	19:46:42.79	.142	46	27 Feb 1987	09:53:33.90	.137
47	27 Feb 1987	05:01:26.07	.137	48	27 Feb 1987	06:13:08.43	.132
49	5 Mar 1987	07:54:56.65	.127	50	27 Feb 1987	09:14:28.38	.127
51	5 Mar 1987	13:07:40.05	.125	52	5 Mar 1987	02:01:54.16	.121
53	5 Mar 1987	17:47:40.62	.119	54	26 Feb 1987	18:53:58.00	.115
55	5 Mar 1987	14:22:26.59	.115	56	5 Mar 1987	14:14:11.34	.114
57	5 Mar 1987	12:53:26.48	.114	58	5 Mar 1987	18:05:28.49	.113
59	27 Feb 1987	08:22:08.87	.109	60	5 Mar 1987	17:53:12.93	.106
61	27 Feb 1987	08:05:05.03	.102	62	5 Mar 1987	02:09:16.74	.100
63	26 Feb 1987	19:41:22.28	.096	64	5 Mar 1987	18:20:11.15	.092
65	5 Mar 1987	07:32:20.18	.091	66	5 Mar 1987	12:08:40.38	.089
67	27 Feb 1987	08:13:28.49	.088	68	27 Feb 1987	07:02:51.78	.088
69	27 Feb 1987	05:27:45.94	.086	70	26 Feb 1987	19:12:45.00	.086
71	5 Mar 1987	02:44:25.65	.086	72	5 Mar 1987	08:36:40.11	.085
73	27 Feb 1987	10:01:09.04	.084	74	5 Mar 1987	12:33:47.98	.082
75	5 Mar 1987	14:39:10.21	.073	76	5 Mar 1987	08:05:35.49	.071
77	5 Mar 1987	01:10:27.36	.070	78	5 Mar 1987	08:14:54.75	.067
79	5 Mar 1987	15:05:45.41	.060	80	27 Feb 1987	10:20:08.27	.057
81	5 Mar 1987	10:18:45.58	.049	82	5 Mar 1987	17:03:11.92	.049
83	5 Mar 1987	09:01:25.09	.035	84	5 Mar 1987	00:47:29.84	.029
85	5 Mar 1987	01:17:28.35	.029	86	5 Mar 1987	08:53:11.57	.028
87	5 Mar 1987	02:34:15.39	.026	88	5 Mar 1987	08:20:42.60	.024
89	5 Mar 1987	14:02:53.10	.020	90	5 Mar 1987	07:47:36.59	.020
91	5 Mar 1987	14:54:08.79	.018	92	5 Mar 1987	00:30:43.58	.015
93	5 Mar 1987	02:49:59.81	.012	94	5 Mar 1987	17:19:04.88	.005
95	5 Mar 1987	17:34:38.86	.004	96	5 Mar 1987	00:59:24.84	.003
97	5 Mar 1987	17:24:44.65	.002	98	5 Mar 1987	00:35:36.68	-.001

AVERAGE FOUR PANEL PRESSURE ON
PANELS #23, 24, 29 AND 30
(RANKING THE PEAK SPATIAL AVERAGE
FOR EACH EIGHT MINUTE WINDOW)

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	20	20.4
2	.050	.100	21	21.4
3	.100	.150	17	17.3
4	.150	.200	16	16.3
5	.200	.250	7	7.1
6	.250	.300	8	8.2
7	.300	.350	3	3.1
8	.350	.400	1	1.0
9	.400	.450	3	3.1
10	.450	.500	0	0.0
11	.500	.550	0	0.0
12	.550	.600	1	1.0
13	.600	.650	0	0.0
14	.650	.700	0	0.0
15	.700	.750	0	0.0
16	.750	.800	1	1.0
Total			98	100.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used

Tre Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	27 Feb 1987	09:39:27.78	.782	2	5 Mar 1987	13:29:28.49	.552
3	5 Mar 1987	10:27:21.46	.442	4	5 Mar 1987	10:44:41.96	.424
5	5 Mar 1987	14:37:01.47	.415	6	5 Mar 1987	12:20:18.15	.356
7	5 Mar 1987	10:51:05.99	.326	8	26 Feb 1987	18:36:42.93	.324
9	27 Feb 1987	05:45:21.91	.320	10	5 Mar 1987	01:55:12.14	.294
11	5 Mar 1987	12:30:18.88	.293	12	27 Feb 1987	07:03:38.04	.277
13	5 Mar 1987	13:33:27.01	.271	14	27 Feb 1987	09:06:44.85	.267
15	27 Feb 1987	04:50:43.86	.266	16	5 Mar 1987	11:34:34.00	.263
17	25 Feb 1987	07:28:24.03	.260	18	27 Feb 1987	06:23:26.39	.244
19	27 Feb 1987	06:07:23.71	.239	20	27 Feb 1987	07:37:07.06	.224
21	27 Feb 1987	10:05:30.85	.210	22	27 Feb 1987	08:42:12.76	.209
23	27 Feb 1987	08:36:37.44	.204	24	27 Feb 1987	06:13:08.35	.204
25	27 Feb 1987	07:44:16.32	.200	26	5 Mar 1987	10:03:11.19	.191
27	5 Mar 1987	11:20:22.04	.180	28	5 Mar 1987	02:01:54.16	.179
29	27 Feb 1987	09:14:28.38	.179	30	5 Mar 1987	11:17:17.84	.177
31	27 Feb 1987	05:58:28.14	.174	32	5 Mar 1987	18:09:13.85	.174
33	5 Mar 1987	10:32:46.11	.169	34	26 Feb 1987	18:46:50.54	.165
35	26 Feb 1987	18:16:27.66	.163	36	27 Feb 1987	06:40:13.66	.161
37	5 Mar 1987	11:06:34.17	.159	38	5 Mar 1987	13:04:25.36	.152
39	26 Feb 1987	19:46:31.76	.152	40	5 Mar 1987	12:49:21.38	.150
41	27 Feb 1987	08:53:50.76	.150	42	5 Mar 1987	13:53:32.62	.144
43	5 Mar 1987	11:39:48.47	.143	44	26 Feb 1987	18:59:26.45	.143
45	27 Feb 1987	07:54:57.27	.136	46	5 Mar 1987	01:41:38.91	.136
47	27 Feb 1987	09:48:05.45	.135	48	5 Mar 1987	12:53:26.10	.127
49	27 Feb 1987	05:01:26.06	.120	50	5 Mar 1987	17:47:40.41	.119
51	26 Feb 1987	19:24:42.56	.119	52	26 Feb 1987	18:28:25.35	.117
53	5 Mar 1987	08:05:35.40	.116	54	5 Mar 1987	18:05:28.39	.114
55	5 Mar 1987	07:56:20.32	.111	56	5 Mar 1987	13:44:46.18	.109
57	27 Feb 1987	10:01:09.04	.103	58	5 Mar 1987	02:26:04.47	.098
59	5 Mar 1987	08:30:56.21	.097	60	27 Feb 1987	08:22:19.14	.094
61	5 Mar 1987	12:34:25.23	.094	62	5 Mar 1987	07:32:19.93	.093
63	26 Feb 1987	19:41:22.21	.090	64	5 Mar 1987	12:06:02.46	.089
65	5 Mar 1987	14:14:11.18	.085	66	27 Feb 1987	08:05:04.96	.082
67	27 Feb 1987	05:25:13.75	.081	68	27 Feb 1987	07:13:54.61	.081
69	5 Mar 1987	08:14:54.68	.079	70	5 Mar 1987	14:42:07.84	.077
71	5 Mar 1987	18:19:54.82	.068	72	5 Mar 1987	14:22:26.59	.064
73	27 Feb 1987	08:13:28.43	.064	74	5 Mar 1987	17:51:17.12	.063
75	5 Mar 1987	02:43:05.48	.061	76	5 Mar 1987	10:18:45.39	.058
77	26 Feb 1987	19:19:38.76	.055	78	27 Feb 1987	10:20:37.47	.053
79	5 Mar 1987	14:54:08.69	.047	80	5 Mar 1987	17:03:11.92	.039
81	5 Mar 1987	02:09:16.71	.033	82	5 Mar 1987	01:05:39.60	.030
83	5 Mar 1987	07:47:36.49	.030	84	5 Mar 1987	14:02:52.92	.029
85	5 Mar 1987	00:47:29.84	.024	86	5 Mar 1987	08:20:42.60	.020
87	5 Mar 1987	15:05:45.35	.016	88	5 Mar 1987	00:32:36.64	.010
89	5 Mar 1987	02:53:30.79	.008	90	5 Mar 1987	08:52:32.09	.008
91	5 Mar 1987	02:34:15.39	.006	92	5 Mar 1987	08:57:27.17	.005
93	5 Mar 1987	17:30:36.98	.005	94	5 Mar 1987	17:19:04.13	.004
95	5 Mar 1987	17:21:07.75	.004	96	5 Mar 1987	00:53:43.72	.004
97	5 Mar 1987	00:34:41.48	.003	98	5 Mar 1987	01:13:17.87	.002

AVERAGE FOUR PANEL PRESSURE ON
PANELS #22, 23, 28 AND 29
(RANKING THE PEAK SPATIAL AVERAGE
FOR EACH EIGHT MINUTE WINDOW)

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	22	22.4
2	.050	.100	21	21.4
3	.100	.150	14	14.3
4	.150	.200	14	14.3
5	.200	.250	9	9.2
6	.250	.300	9	9.2
7	.300	.350	3	3.1
8	.350	.400	2	2.0
9	.400	.450	2	2.0
10	.450	.500	1	1.0
11	.500	.550	0	0.0
12	.550	.600	1	1.0
Total			98	100.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used

The Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	5 Mar 1987	11:45:19.61	.555	2	27 Feb 1987	07:02:51.71	.475
3	5 Mar 1987	10:27:21.46	.422	4	5 Mar 1987	13:29:28.49	.419
5	5 Mar 1987	01:55:12.14	.395	6	5 Mar 1987	10:45:29.08	.383
7	27 Feb 1987	05:01:25.99	.341	8	26 Feb 1987	18:36:42.93	.330
9	5 Mar 1987	12:17:43.00	.321	10	5 Mar 1987	11:04:11.38	.291
11	5 Mar 1987	10:51:05.92	.286	12	5 Mar 1987	12:49:21.38	.281
13	27 Feb 1987	05:58:28.14	.281	14	5 Mar 1987	01:41:38.76	.269
15	27 Feb 1987	09:13:21.22	.268	16	5 Mar 1987	07:56:20.35	.266
17	27 Feb 1987	04:50:43.86	.255	18	5 Mar 1987	12:30:18.88	.253
19	27 Feb 1987	05:45:21.91	.246	20	27 Feb 1987	07:45:10.17	.246
21	5 Mar 1987	11:34:15.19	.245	22	5 Mar 1987	10:09:44.63	.235
23	27 Feb 1987	07:54:23.84	.230	24	5 Mar 1987	13:33:27.01	.226
25	27 Feb 1987	06:03:37.17	.223	26	5 Mar 1987	08:03:42.79	.210
27	27 Feb 1987	09:39:27.77	.208	28	25 Feb 1987	07:28:24.03	.197
29	5 Mar 1987	14:37:01.44	.193	30	5 Mar 1987	11:20:29.33	.195
31	27 Feb 1987	10:01:09.04	.183	32	5 Mar 1987	18:09:14.97	.182
33	27 Feb 1987	07:39:27.01	.179	34	5 Mar 1987	11:15:23.38	.178
35	5 Mar 1987	14:45:18.40	.169	36	26 Feb 1987	18:19:07.15	.168
37	5 Mar 1987	18:20:11.04	.165	38	5 Mar 1987	10:37:47.45	.162
39	5 Mar 1987	13:04:25.36	.155	40	27 Feb 1987	08:13:28.43	.155
41	27 Feb 1987	06:26:33.37	.150	42	5 Mar 1987	12:55:44.52	.148
43	5 Mar 1987	12:33:47.98	.140	44	5 Mar 1987	18:05:28.39	.130
45	5 Mar 1987	08:35:14.39	.125	46	26 Feb 1987	18:58:56.23	.123
47	26 Feb 1987	18:48:58.55	.123	48	5 Mar 1987	14:26:10.37	.121
49	26 Feb 1987	19:19:38.76	.120	50	27 Feb 1987	08:35:01.34	.118
51	5 Mar 1987	13:43:22.49	.115	52	26 Feb 1987	18:30:42.50	.110
53	27 Feb 1987	07:09:30.13	.107	54	27 Feb 1987	08:24:04.32	.103
55	5 Mar 1987	02:26:04.47	.100	56	26 Feb 1987	19:23:13.24	.100
57	27 Feb 1987	08:42:12.76	.099	58	5 Mar 1987	07:32:19.93	.097
59	5 Mar 1987	14:14:11.18	.088	60	5 Mar 1987	10:13:47.47	.087
61	27 Feb 1987	06:42:16.26	.085	62	5 Mar 1987	12:06:02.33	.085
63	27 Feb 1987	06:13:02.09	.084	64	5 Mar 1987	14:49:14.14	.084
65	27 Feb 1987	08:56:39.90	.082	66	5 Mar 1987	13:53:32.69	.080
67	27 Feb 1987	05:25:13.75	.080	68	26 Feb 1987	19:46:23.57	.075
69	27 Feb 1987	09:53:08.85	.071	70	26 Feb 1987	19:41:30.79	.070
71	27 Feb 1987	09:04:19.85	.070	72	5 Mar 1987	02:02:09.21	.068
73	5 Mar 1987	00:58:56.16	.067	74	5 Mar 1987	02:10:05.90	.062
75	5 Mar 1987	02:43:05.48	.057	76	27 Feb 1987	10:20:37.47	.052
77	5 Mar 1987	00:46:12.30	.048	78	5 Mar 1987	08:14:54.68	.047
79	27 Feb 1987	10:05:30.81	.047	80	5 Mar 1987	09:00:57.93	.045
81	5 Mar 1987	14:03:13.34	.042	82	5 Mar 1987	17:56:33.66	.036
83	27 Feb 1987	08:05:04.90	.034	84	5 Mar 1987	17:03:31.04	.024
85	5 Mar 1987	15:05:31.54	.018	86	5 Mar 1987	17:24:46.62	.012
87	5 Mar 1987	07:47:53.61	.011	88	5 Mar 1987	08:53:10.21	.008
89	5 Mar 1987	01:13:17.87	.007	90	5 Mar 1987	02:34:40.87	.007
91	5 Mar 1987	02:53:30.79	.006	92	5 Mar 1987	08:19:36.31	.005
93	5 Mar 1987	01:06:28.24	.005	94	5 Mar 1987	00:32:36.64	.004
95	5 Mar 1987	17:19:04.28	.004	96	5 Mar 1987	17:34:43.85	.003
97	5 Mar 1987	17:40:09.68	.003	98	5 Mar 1987	00:35:36.39	.002

AVERAGE FOUR PANEL PRESSURE ON
PANELS #17, 18, 22, 23, 24, 28, 29 AND 30
(RANKING THE PEAK SPATIAL AVERAGE
FOR EACH EIGHT MINUTE WINDOW)

All Panels have been AVERAGED together

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

Bin #	From (Mpa)	To (Mpa)	Number in Bin	Percent (%)
1	0.000	.050	28	28.6
2	.050	.100	36	36.7
3	.100	.150	14	14.3
4	.150	.200	12	12.2
5	.200	.250	5	5.1
6	.250	.300	1	1.0
7	.300	.350	0	0.0
8	.350	.400	1	1.0
Total			97	99.0

FR 59.5	FR 60.0	FR 60.5	FR 61.0	FR 61.5	FR 62.0
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	Not Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used
Not Used	Not Used	Used	Used	Used	Not Used

The Ranked Average Panel Pressures

No.	Date	Time	Press (MPa)	No.	Date	Time	Press (MPa)
1	27 Feb 1987	09:39:27.79	.384	2	5 Mar 1987	11:45:19.61	.258
3	27 Feb 1987	07:02:51.71	.238	4	5 Mar 1987	13:29:28.49	.231
5	5 Mar 1987	13:33:27.11	.218	6	5 Mar 1987	10:27:21.46	.209
7	5 Mar 1987	12:30:19.05	.205	8	27 Feb 1987	05:43:53.18	.197
9	5 Mar 1987	01:55:12.14	.192	10	27 Feb 1987	07:37:07.12	.174
11	5 Mar 1987	10:44:41.96	.171	12	25 Feb 1987	07:28:24.03	.166
13	5 Mar 1987	12:49:21.51	.166	14	5 Mar 1987	14:37:01.47	.164
15	5 Mar 1987	12:20:18.15	.161	16	5 Mar 1987	01:41:38.97	.159
17	27 Feb 1987	06:03:37.17	.157	18	27 Feb 1987	04:50:43.91	.154
19	26 Feb 1987	18:36:42.93	.152	20	5 Mar 1987	11:11:25.74	.149
21	5 Mar 1987	11:34:34.00	.147	22	27 Feb 1987	05:01:25.99	.143
23	5 Mar 1987	10:51:05.92	.141	24	27 Feb 1987	05:58:28.14	.141
25	5 Mar 1987	11:04:11.38	.131	26	27 Feb 1987	09:13:21.22	.130
27	27 Feb 1987	07:50:52.94	.127	28	27 Feb 1987	09:06:44.85	.124
29	27 Feb 1987	06:23:26.39	.119	30	27 Feb 1987	07:54:23.84	.117
31	5 Mar 1987	07:56:20.35	.115	32	27 Feb 1987	08:42:12.76	.109
33	5 Mar 1987	10:09:44.63	.108	34	5 Mar 1987	08:03:42.79	.099
35	5 Mar 1987	18:09:13.98	.097	36	27 Feb 1987	08:50:29.42	.093
37	5 Mar 1987	13:54:55.23	.092	38	5 Mar 1987	11:20:29.33	.090
39	27 Feb 1987	06:13:08.35	.086	40	5 Mar 1987	12:53:26.10	.085
41	5 Mar 1987	13:04:25.36	.082	42	5 Mar 1987	10:37:47.30	.082
43	27 Feb 1987	08:36:37.44	.082	44	5 Mar 1987	02:01:54.16	.082
45	27 Feb 1987	10:05:30.85	.081	46	5 Mar 1987	13:46:03.48	.080
47	27 Feb 1987	10:01:09.04	.079	48	5 Mar 1987	14:45:18.40	.079
49	26 Feb 1987	18:50:37.85	.076	50	5 Mar 1987	18:20:11.04	.075
51	27 Feb 1987	06:40:17.64	.072	52	5 Mar 1987	02:26:04.59	.072
53	26 Feb 1987	18:28:25.38	.071	54	27 Feb 1987	07:13:54.75	.071
55	26 Feb 1987	18:19:07.15	.070	56	27 Feb 1987	09:48:05.45	.069
57	26 Feb 1987	19:24:42.56	.068	58	27 Feb 1987	08:13:28.43	.066
59	5 Mar 1987	08:52:27.74	.065	60	26 Feb 1987	18:57:21.30	.064
61	5 Mar 1987	12:33:47.98	.064	62	5 Mar 1987	08:35:14.39	.063
63	26 Feb 1987	19:19:38.76	.062	64	26 Feb 1987	19:46:31.76	.060
65	5 Mar 1987	14:26:10.37	.059	66	5 Mar 1987	18:05:28.39	.057
67	5 Mar 1987	17:47:40.41	.053	68	5 Mar 1987	14:14:11.34	.053
69	27 Feb 1987	08:22:08.87	.051	70	5 Mar 1987	07:32:19.93	.046
71	27 Feb 1987	08:05:04.96	.046	72	5 Mar 1987	17:53:12.93	.046
73	5 Mar 1987	02:09:16.74	.043	74	5 Mar 1987	02:44:25.65	.042
75	5 Mar 1987	12:06:02.33	.042	76	5 Mar 1987	14:49:14.14	.041
77	5 Mar 1987	10:13:47.47	.039	78	27 Feb 1987	05:25:37.32	.039
79	5 Mar 1987	08:14:54.68	.038	80	26 Feb 1987	19:41:22.28	.038
81	5 Mar 1987	01:10:27.36	.030	82	5 Mar 1987	00:58:56.16	.028
83	5 Mar 1987	15:05:45.41	.028	84	27 Feb 1987	10:20:37.47	.027
85	5 Mar 1987	17:03:11.92	.022	86	5 Mar 1987	09:00:57.93	.021
87	5 Mar 1987	14:03:13.34	.020	88	5 Mar 1987	00:46:12.30	.019
89	5 Mar 1987	07:47:36.49	.015	90	5 Mar 1987	02:34:15.39	.012
91	5 Mar 1987	01:17:28.35	.012	92	5 Mar 1987	08:20:42.60	.010
93	5 Mar 1987	02:49:59.81	.007	94	5 Mar 1987	00:32:36.64	.006
95	5 Mar 1987	17:19:04.88	.004	96	5 Mar 1987	17:24:46.62	.003
97	5 Mar 1987	17:34:38.86	.003	98	5 Mar 1987	00:35:36.39	-0.000

APPENDIX F

BEHAVIOUR AND MODELLING OF TILTED ANGLE SECTIONS

APPENDIX F

Behaviour and Modelling of Tilted Angle Sections

Introduction

The framing of the CAPE BRIER consists of tilted angles (200 X 100 X 12 mm angles) welded to the shell plate. The frames were instrumented with strain gauges measuring shear on the web. A finite element model of the frames was constructed using shell elements. When the finite element results were compared to a physical calibration of the system, the correlation was found to be very poor. The purpose of this appendix is to discuss the reasons for the poor correlation. The source of the problem has been found, although a simple remedy has not.

Shear and Shear Centre

When a section is undergoing shear, a shear flow is established in the cross section of the member. In the plane of the cross section, the torsion due to the shear flow must be in balance with torsion due to the applied load. The torsion due to the shear flow is zero when the external load acts through a point called the shear centre. Figure F-1 shows the shear centres of a number of typical sections. If the external load does not act through the shear centre, then a net external torsion is introduced, which must be resisted by additional torsional (shear) and warping stresses. The shear centre of angle frames (as on the CAPE BRIER) is at the intersection of the web and the flange (see Figure F-2). The load is applied to the section through the root of the web and is therefore eccentric to the shear centre. The resulting torsion is combined with the transverse shear to create a complex state of shear stress in the member.

Torsion in Thin Wall Sections

There are two kinds of thin wall sections: open and closed (see Figures F-3 a and b)[Hughes, 1983]. An open section can be circumscribed by a single boundary. A closed section has at least two boundaries (i.e. an inside and an outside). The shear stress due to torsion in an open section can be determined from the membrane analogy (see Timoshenko and Goodier, 1970) and is shown in Figure F-3a. The shear is linearly distributed through the thickness and has a zero mean. This is a very inefficient distribution of stress and results in a torsionally flexible member. In a closed section, the shear can flow all around the member and results in the shear stress as shown in Figure F-3b. The shear is constant across the section. This is a very efficient distribution of shear stress and results in a torsionally stiff member.

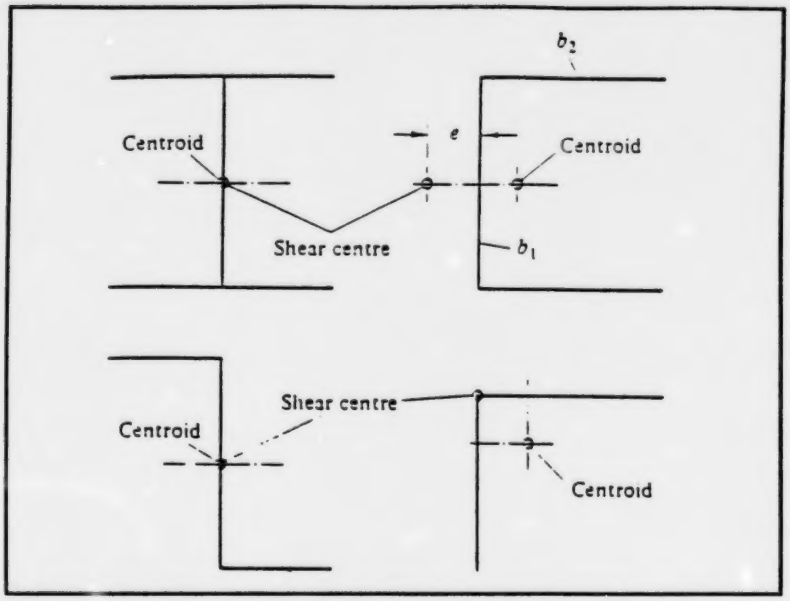


Figure F.1: Shear Centre Positions for Various Sections (from Allen and Bulson 1980)

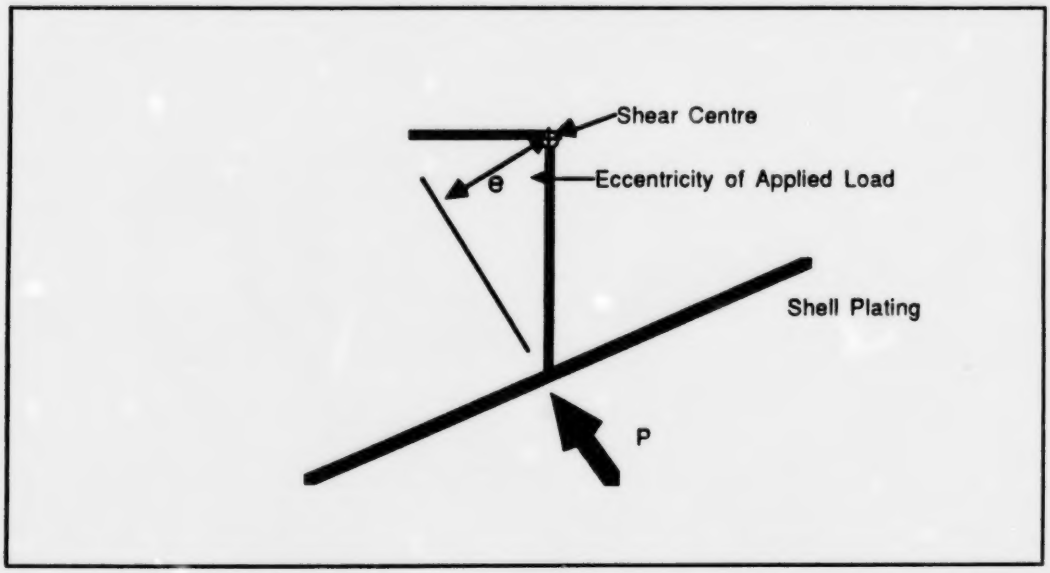
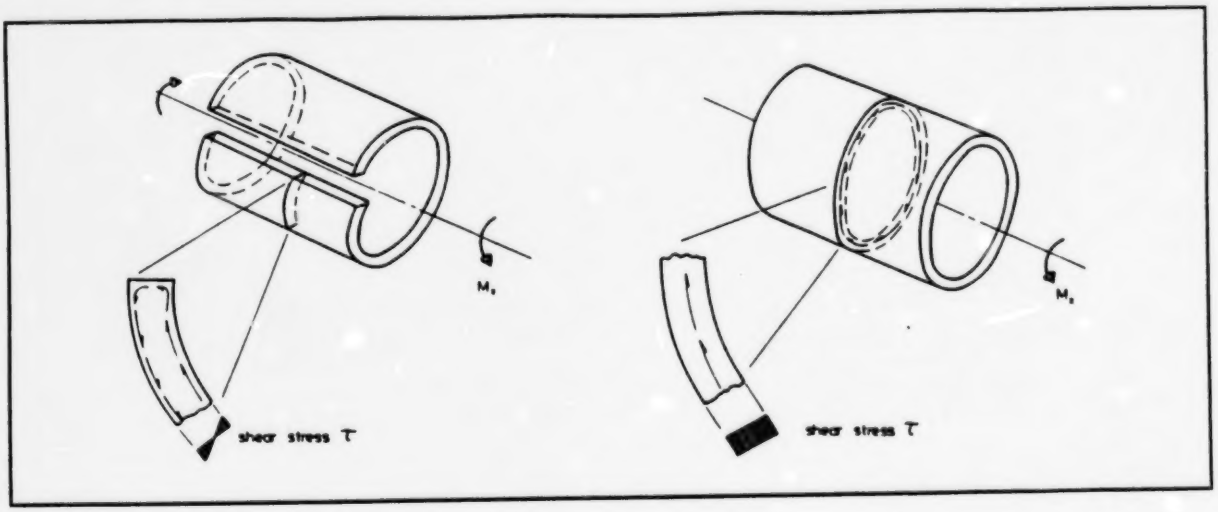


Figure F.2 Development of Torsional Stresses in Tilted Angle Frames



a. b.

Figure F.3 a. Shear Stress in Open Section (from Hughes 1983)
b. Shear Stress in Closed Section

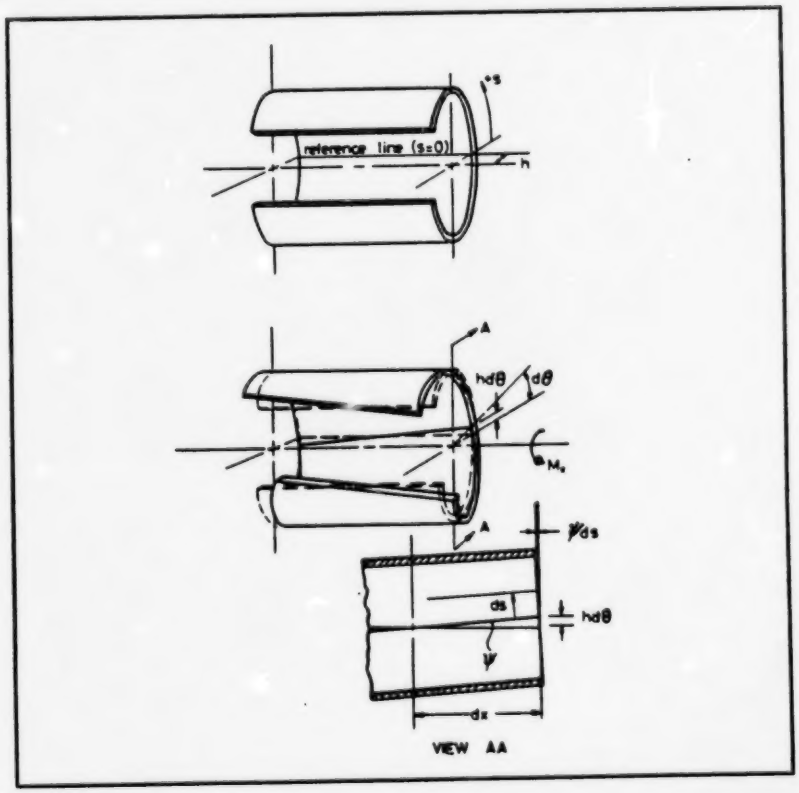


Figure F.4 Warping in an Open Section (from Hughes 1983)

Warping

Warping is defined as the distortion in the axial direction due to torsion. Figure F-4 [Hughes] shows the warping of an open section. In this case, there is no restraint on the warping deflection (call this free warping). Because the torsional shear stress has a zero mean, the warping is not due to in-plane shear distortion. Rather the warping is due to the rigid body rotation of the member wall within its own plane. This rigid body rotation is directly related to the axial (torsional) rotation of the member, in such a way as to keep a mean shear stress everywhere at zero. In a closed section (or solid section), the net shear stress is not zero and the warpage is not just due to rigid body rotation. Locally, rigid body rotations do take place, accompanied by balancing shear stresses. Figure F-5 shows the warping that is experienced in a square solid (or thin wall hollow) section [Timoshenko and Goodier]. The warping distortions can be calculated from elasticity theory. In open sections, the low torsional stiffness can result in large angles of torsion and large warpage deflections. These may be outside the limits of small deflection theory that is normally used in finite element analysis of linear elastic structures.

Warping Restrained

When a frame is comprised of a series of prismatic, but differing, elements (i.e. web, flange and shell plate) each part will be constrained to warp in such a way as to be compatible with the connected segments. This will result in a balancing shear that will be applied to each member by it's neighbours. A constant shear stress through the thickness will result.

F.E. Model of Torsion in a Flat Bar

To examine the capability of the F.E. program to handle warping, two simple models of a rectangular flat bar were constructed. The first model consisted of 12 shell elements (4 long X 3 high) subjected to a torsion on the end. These were the same type of elements used to model the CAPE BRIER frames. The model exhibited no warping behaviour. The shell elements do not model a through-thickness shear distribution and so cannot model torsional or warping stresses. This was the source of the poor correlation mentioned above.

The second model constructed was also a model of a rectangular flat bar. In this case, 192 eight noded brick elements (6 high X 8 long X 4 through-thickness (see Figure F-6)) were used. The cross section of the bar was .1" X .6" X 1". It was subjected to a torsion of 1.2 in.lb.

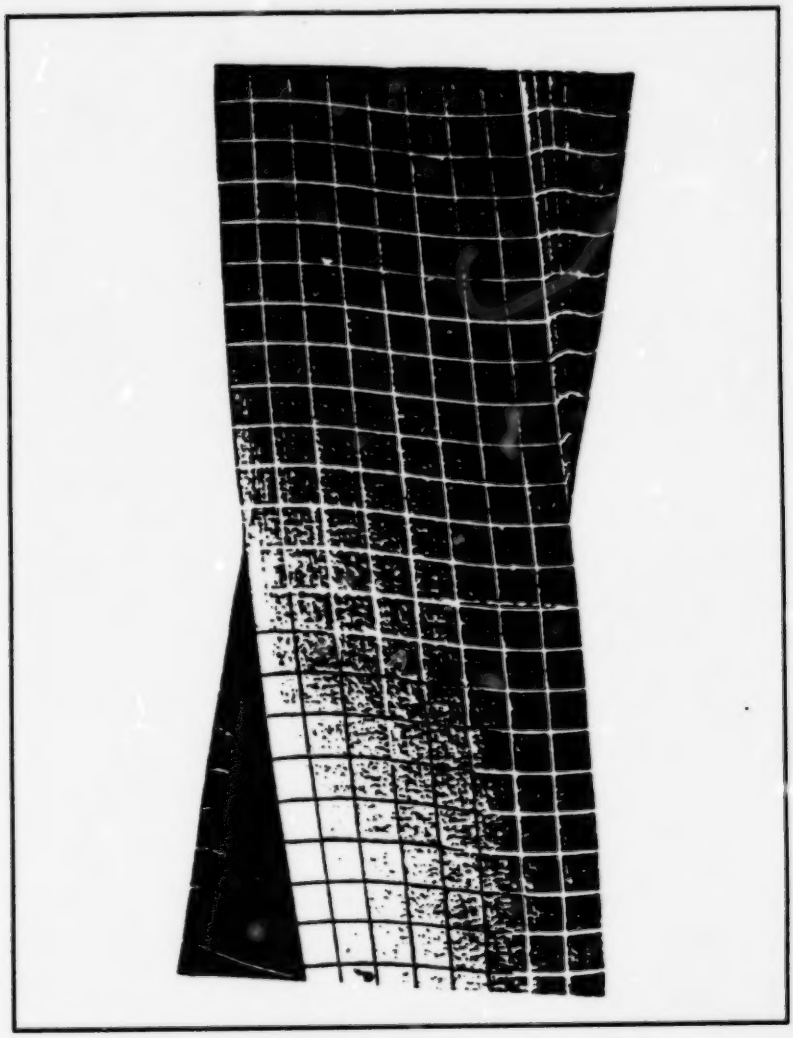


Figure F.5 Warping in a Closed or Solid Section (from Timoshenko and Goodier 1970)

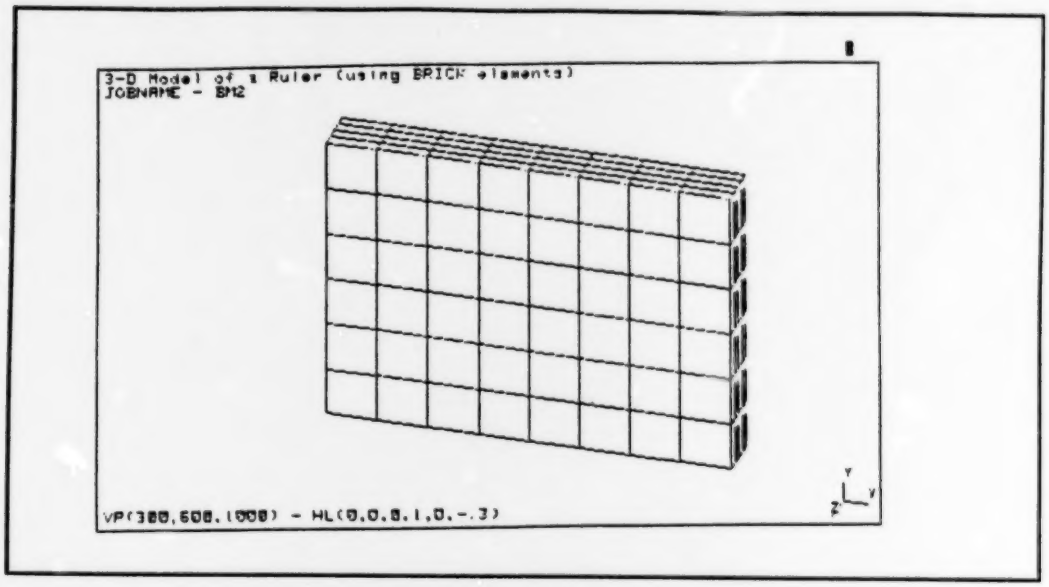


Figure F.6 Finite Element Model of Torsion and Warping of a Rectangular Bar using Brick Elements.

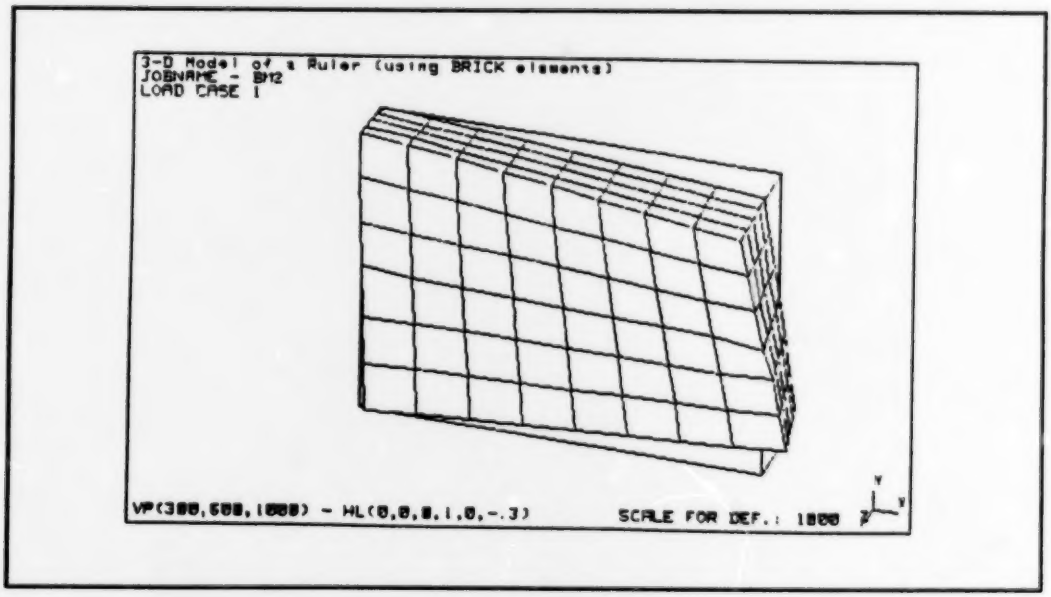


Figure F.7 Deflected Shape of Rectangular Bar F.E. Model

According to Timoshenko, the surface stress should be

$$\tau_{max} = \frac{6T}{bc^2}$$

$$= 1200 \text{ psi}$$

where b = height = .6"
c = thickness = .1"
T = torque = 1.2 in.lb.
τ = shear stress

This formula considers both torsion and warping distortions. Torsion alone would produce half the shear stress (i.e. 600 psi).

Figure F-8 shows the through-thickness variation in shear stress for the F.E. model (at 2 sections) compared to elasticity theory for torsion and warping and for torsion only. The F.E. results are close to the torsion only stresses (somewhat higher due to a non-ideal application of the torsion at the ends). The deflected shape of the brick model is shown in Figure F-7. While the model as a whole exhibited some warping behaviour, it was due to the cumulative effects of the torsional response of the elements. If the elements themselves had been able to warp, the total warping (and resulting strain) would have been twice as much.

Timoshenko describes the torsional and warping behaviour of a flat bar and points out that for a narrow rectangular section, the torsion and warping shear stresses are of equal magnitude.

As a final check, the suppliers of the FESDEC program were asked about the warping behaviour of various elements. Their response was that none of the elements in FESDEC contained formulation that considered warping.

Summary of Findings

First, consider the open section shown in Figure F-9. The figure shows a cross-section, an oblique view and a top view of a circular open section. The undeformed state is shown in Figure F-9a. In Figure F-9b, a torsional load is applied to the ends of the section. The section warps due to the through thickness shear, τ_1. There is no net shear on the wall and square patches remain square. As part of the warping, all surface elements rotate in the plane of the surface. This warping behaviour is not modelled by FESDEC.

Figure F-9c shows the effect of a restraint on the warping (shown as two forces from the boundaries). A shear τ_2 results, which distorts the surface (square section becomes diamond). This stress is also a result of the warping distortions caused by τ_1. τ_2 therefore, is not modeled by FESDEC either.

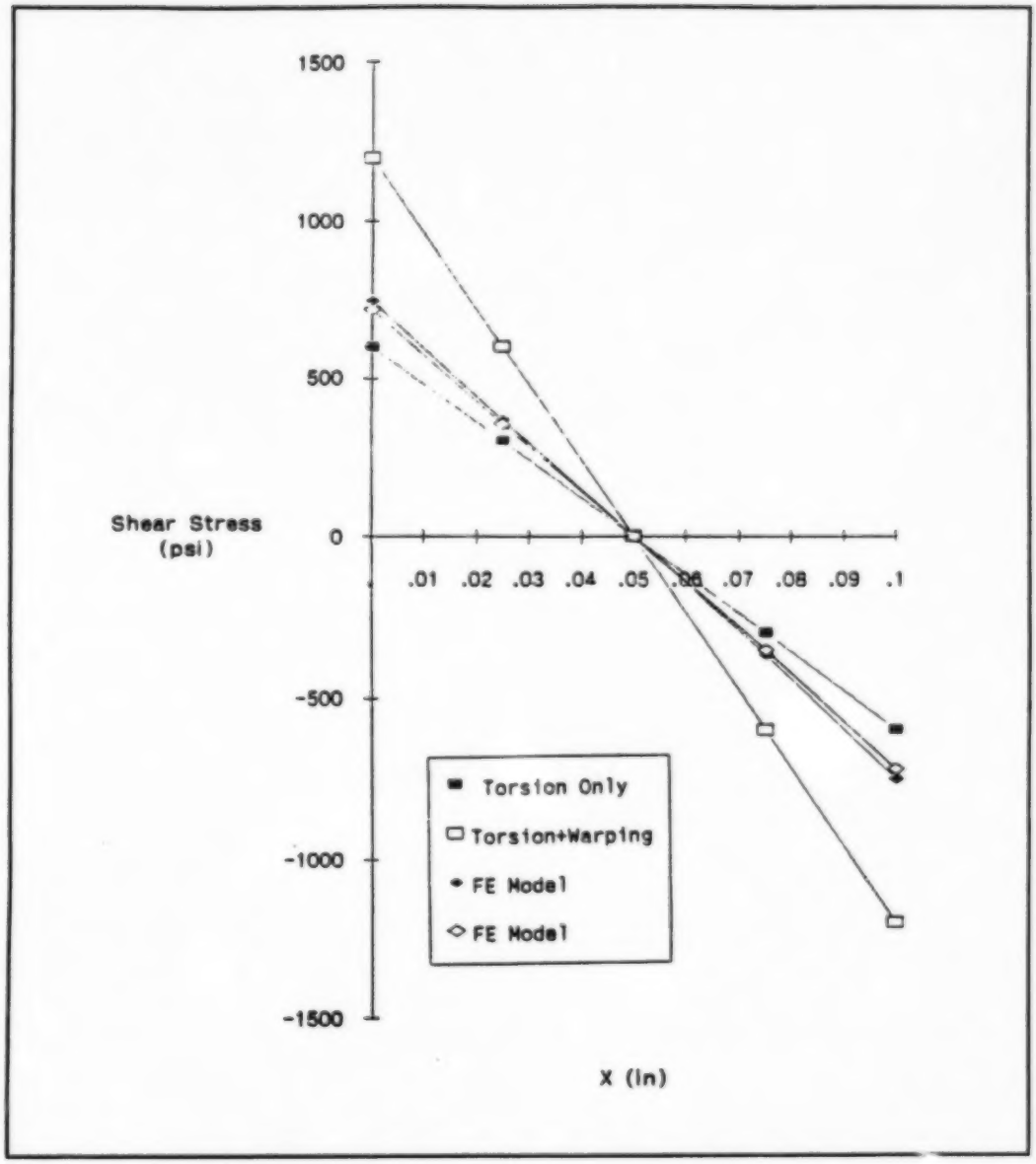


Figure F.8
Shear Stress Through Thickness of a Rectangular Flat Bar Finite Element and Theoretical Results Compared.

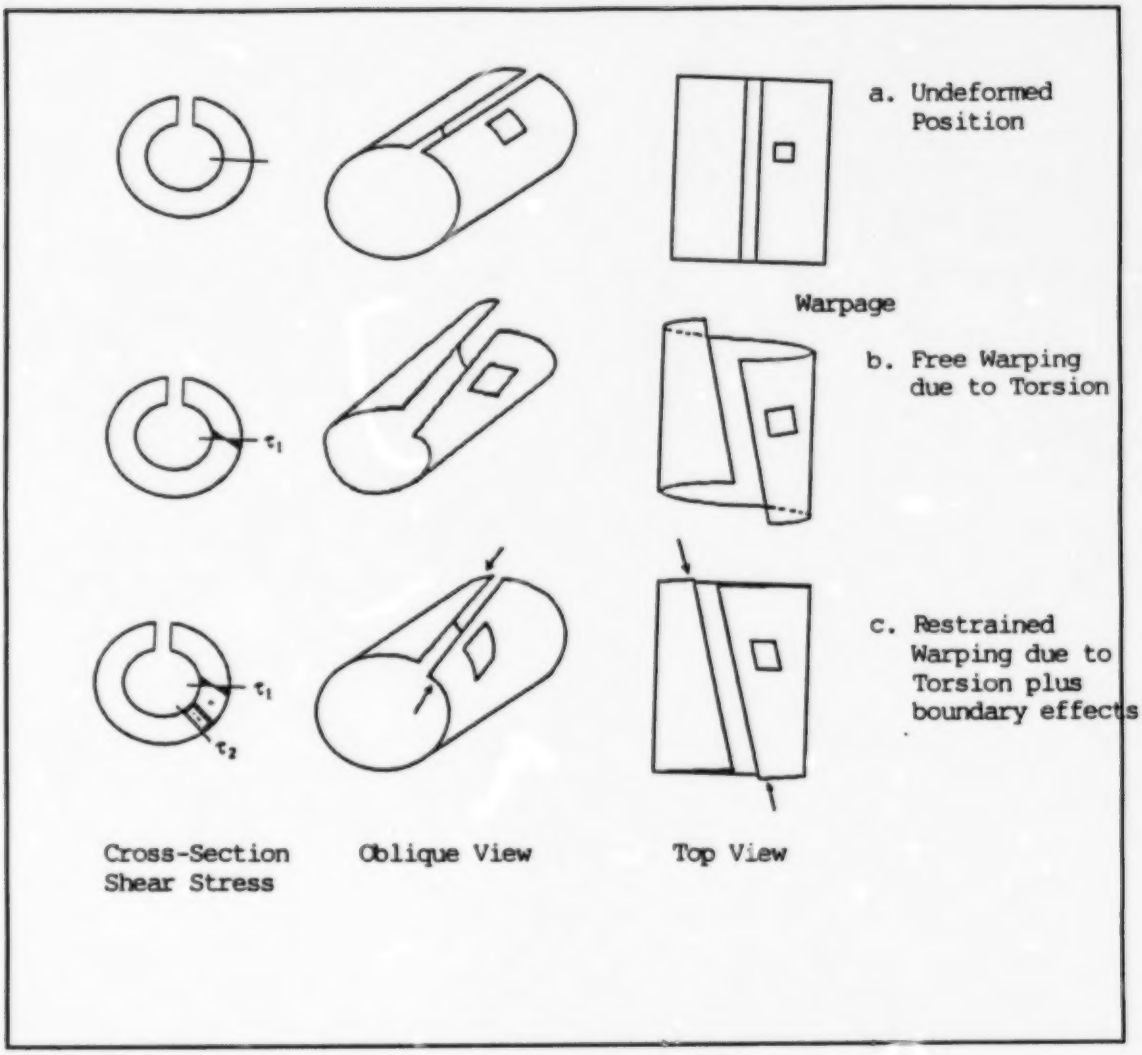


Figure F.9 Behavior of Open Sections with Free and Restrained Warping due to Torsion

The development of the instrumentation system for the CAPE BRIER was based on the assumption that the angle frames behave primarily as beams subject to bending and shear. The torsional and warping distortions and stresses were assumed to be small. The inability of the F.E. model to reproduce the physical calibration results has lead to a re-examination of that assumption. It is nov clear that the F.E. model was incapable of modelling the torsional and warping behaviour of the frames. It is not yet possible to say what the magnitude of the induced warping shears was. That would require a F.E. model which could model warping. it is strongly supposed that the warping stresses were very significant and were the cause of the modelling problems.

The following points are presented to help guide any future similar work.

- Warping is a complex 3D stress problem. It is normally a linear, elastic problem, but a particularly difficult one (not easily formulated in F.E. models). If warping deflections or rotation are large, the problem could become a geometrically non-linear one.

- Warping and torsion interact. To properly solve the torsion problem, the contribution of fillets (joining web to flange for instance) must be considered. Timoshenko has shown their effects to be large.

- Any F.E. analysis of a warping problem should be preceded by a thorough check of the warping capabilities of the F.E. program. Simple problems can be checked against exact analytical solutions.

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